SECTION 10.0

DEVELOPMENT RECOMMENDATIONS

This report summarizes the essential facts and findings of Tasks 1 through 9 and concludes with the development recommendations for the project. Most of the information in the first nine sections of this report was excerpted from the *First, Second,* and *Third Draft Reports*, and updated wherever necessary. For reference, the Tables of Contents for these first three reports are contained in Appendix H.

10.1 INVENTORY OF EXISTING INFORMATION

Discussed in the *First Draft Report*, this task involved the identification and collection of vital information concerning ARFF "live fire" training requirements and guidelines. This information, highlighted below, was largely obtained from the Federal Aviation Administration (FAA), International Civil Aviation Organization and the National Fire Protection Association.

10.1.1 Federal Aviation Administration

Federal Aviation Regulations (FAR) Part 139 - *Certification and Operations: Land Airports Serving Certificated Scheduled Air Carriers Operating Large Aircraft* requires that:

> "Each certificate holder provide rescue and fire fighting capability and that the rescue/fire fighting personnel are properly trained [FAA, 1992a]."

In accordance with this regulation, Part 139 certificated airports are classified by indexes A through E based on the longest length of air carrier aircraft and number of operations by this aircraft type. This Part 139 index also determines the number and type of fire fighting equipment required for the airport.

Part 139 ARFF training requirements include airport and aircraft familiarization, safety, incident communications, hazardous cargo, proper use of equipment, and application of extinguishing agents. Moreover, of upmost importance to this study, Part 139 requires that:

> "All ARFF personnel serving certificated airports participate in at least one 'live-fire' drill every 12 months."

Unfortunately, the term "live-fire" drill is not defined in Part 139 and, therefore, an acceptable level of training to meet this requirement is not fully understood.

FAA Advisory Circular (AC) 150/5220-17A, *Design Standards for Aircraft Rescue and Fire Fighting Training Facilities* is used as a design guideline for ARFF live fire training facilities receiving federal funds [FAA, 1992b]. According to this AC:

> "Certificated airports should provide its ARFF personnel with realistic training in the application of extinguishing agents and devices comparable to those used at the airport."

The Part 139 Index, mentioned above, is also used in this AC as a means of determining the appropriately sized live fire area for the ARFF training facility.

Several other AC's published by the FAA contain recommended ARFF training curriculum (AC 150/5210-16) and provide information on extinguishing agents (AC 150/5210-6L), incident communications (AC 150/5210-7B), protective clothing (AC 150/5210-14), ARFF building design (AC 150/5210-15), vehicle specifications (AC 150/5220-10A, 14A & 19) and airport emergency response plans (AC 150/5200-31).

The *Airport and Airway Improvement Act of 1982* also contains important information that pertains to ARFF training facilities. Section 503 (Definitions) defines "airport development" to include:

> " ... any acquisition of land for, or work involved to construct, a burn area training structure on or off the airport for the purpose of providing live fire

> drill training for aircraft rescue and fire fighting personnel required to receive such training by a regulation of the Department of Transportation, including basic equipment and minimum structures to support such training in accordance with standards of the Federal Aviation Administration."

This definition allows for the construction of ARFF training facilities using Airport Improvement Program (AIP) funds in accordance with the Aviation Safety and Capacity Expansion Act of 1990, if the activity is undertaken by the sponsor, owner, or operator of a public use airport [Tianin, 1994].

Presently, there are no known FAA guidelines which specifically address the funding, location or type of regional ARFF training facilities nationwide. Instead, each FAA region is responsible for developing its own plan for implementing a "state-by-state" approach whereby AIP funds would be used to construct ARFF training facilities in select areas [Costillano, 1994]. The number of facilities in each region, or state, would depend on the geographic size of the state and the demonstrated demand for the facility. Due to current funding limitations and the high cost of the first few regional ARFF training facilities, the FAA plan assumes that only a few facilities would be built in each FAA region.

According to FAA personnel in the Western Pacific Region, the number of ARFF training facilities has not been predetermined but will be based on the demonstration of need by each state [Critchfield, 1994]. The FAA Western Pacific Region includes Arizona, California, Nevada, Hawaii, and other U. S. territories of the Pacific Islands.

10.1.2 International Civil Aviation Organization

The International Civil Aviation Organization (ICAO) has several publications containing information on ARFF training and operations. The most relevant, the *Airport Services Manual Part 1 - Rescue and Fire Fighting*, contains recommendations for ARFF personnel basic training [ICAO, 1990]. According to the ICAO:

> "ARFF training should address fire causes and extinction, extinguishing agents, care and handling of equipment, airport and aircraft familiarization,

search and rescue, accident site approach, positioning of equipment and medical first aid."

This publication also contains guidelines on levels of fire fighter protection, ARFF stations, and ARFF vehicles. The ICAO does not publish any specific guidelines on the frequency of live fire training for ARFF personnel.

10.1.3 National Fire Protection Association

The National Fire Protection Association (NFPA) also produces information in connection with ARFF services and training. The publication, NFPA 403 *Aircraft Rescue and Fire Fighting Services at Airports*, identifies airport responsibilities for the provision of ARFF services similar to those contained in FAR Part 139, discussed previously. The appendix to NFPA 403 also provides training guidelines for ARFF personnel which recommends that:

"Live fire exercise instruction should include, but may not be limited to, exterior fuel fires, interior fires, engine fires, wheel fires and fires involving on-board auxiliary power units."

NFPA 1003 *Airport Fire Fighter Professional Qualifications* identifies the knowledge and skills required of an airport fire fighter for the attack, control and extinguishment of fires involving aircraft and airport facilities. Again, for informational purposes, the appendix to this NFPA document provides explanatory material in the utilization of live fire training facilities for aircraft fuel, three dimensional and interior fires. This NFPA material also recognizes:

" ... the environmental concerns of traditional flammable liquid training fires and considers flammable gas propane as an acceptable substitute."

This same appendix contains numerous basic design recommendations for ARFF training facility aircraft and aircraft component mock-ups.

Table 10.1 provides a summary of this, and other existing, information available from the FAA, ICAO and NFPA as it pertains to ARFF live fire training facilities.

10.2 FACILITY DEMAND FORECAST

Also discussed in the *First Draft Report*, this task evaluated and quantified the existing and future needs for an ARFF training facility in the State of Arizona. Potential "users" of the facility were categorized as (1) Arizona airports, (2) military installations (3) out-of-state airports and (4) non-aviation users.

10.2.1 Arizona Airports

For the purposes of this study, FAR Part 139 certificated airport fire fighting and rescue personnel are considered the "primary" users of an ARFF training facility in Arizona. State-wide, 11 airports presently meet this criteria and they are identified on Figure 10.1. In addition, there are approximately 100 non-certificated airports in Arizona that serve either commercial or general aviation aircraft. The five non-certificated airports that have commercial service are also shown on Figure 10.1

In order to (1) determine which of the Arizona airports would likely benefit from an ARFF training facility and (2) to better evaluate their individual training needs, a survey was developed and distributed early in this study. From this survey, the following general profile of Arizona-based ARFF live fire training was developed:

- Of the 25 airport respondents, 11 are currently FAR Part 139 certificated (8 are Part 139 Index A and 3 are Index E), 1 expects certification soon and 13 are classified as general aviation.
- If a facility were built, all of the Part 139 certificated airports and a number of general aviation airports would use it, or consider using it, if the training was affordable.

TABLE 10.1

ARFF-RELATED TRAINING REQUIREMENTS AND GUIDELINES

Agency	Regulation/Guideline	Section	Relevance
Federal Aviation Administration	Federal Aviation Regulation Part 139 - Certification and Operations: Land Airports Serving CAB - Certificated Scheduled Air Carriers Operating Large Circraft	§139.1 Applicability	Prescribes rules for certificated airports which serve scheduled or unscheduled air carriers using aircraft with seating capacity of more than 30 passengers.
		§139.315 Aircraft Rescue and Fire Fighting: Index Determination	Determines airport index based on length of aircraft groups and number of departures.
		§139.317 Aircraft Rescue and Fire Fighting: Equipment and Agents	Identifies minimum requirements for vehicles, equipment and agents.
		§139.319 Aircraft Rescue and Fire Fighting Operational Requirements	Requires personnel be properly trained and identifies curriculum; requires at least one live-fire drill every 12 months.
	Advisory Circular 150/5220-17A Design Standards for an Aircraft Rescue and Fire Fighting Training Facility	All sections	Contains standards, specifications and recommendations for the design of an ARFF utilizing either propane or liquid hydrocarbons.
	AC 150/5210-16 Availability of Basic Aircraft Rescue and Fire Fighting Curriculum	All sections	Announces the Standardized Basic Aircraft Rescue and Fire Fighting Training Course.
	AC 150/5210-6C Aircraft Fire and Rescue Facilities and Extinguishing Agents	All sections	Outlines proper use and application of agents.
	AC 150/5210-7B Aircraft Fire and Rescue Communications	All sections	Provides ARFF guidelines for airport communication systems.
	AC/5210-14 Airport Fire and Rescue Personnel Protective Clothing	All sections	Provides specifications for suits and other personnel gear.

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TABLE 10.1

ARFF-RELATED TRAINING REQUIREMENTS AND GUIDELINES
(continued)

Agency	Regulation/Guideline	Section	Relevance
Federal Aviation Administration (continued)	AC 150/5210-15 Airport Rescue and Fire Fighting Station Building Design	All sections	Contains standards and guidelines for ARFF buildings.
	AC 150/5220-4B Water Supply Systems for Aircraft Fire and Rescue Protection	All sections	Guidelines on the selection of water sources.
	AC 150/5220-10A Guide Specification for Water/Foam Aircraft Rescue and Fire Fighting Vehicles	All sections	Contains performance standards for ARFF vehicles
	AC 150/5220-14A Airport Fire and Rescue Vehicle Specification Guide	All sections	Contains procurement specifications for ARFF vehicles
	AC 150/5220-19 Guide Specification for Small, Dual Agent Aircraft Rescue and Fire Fighting Vehicles	All sections	Contains performance standards for small ARFF vehicles
	AC 150/5200-31 Airport Emergency Plan	All sections	Provides guidance for preparation of emergency plans
	AC 139.49-1 Programs for Training of Fire Fighting and Rescue Personnel	All sections	Guidelines on conducting live fires.
	Airport and Airway Improvement Act of 1982	§503(a)(2)(D) Definitions	Includes the acquisition of land, performance of work and purchase of equipment in support of an ARFF training facility in the definition of airport development and within the Airport Improvement Program (AIP).
	Aviation Safety and Capacity Expansion Act of 1990	§9102	Allows funding of ARFF training facilities with AIP funds
International Civil Aviation Organization	Airport Services Manual Part 1 Rescue and Fire Fighting	Chapter 14 - Training	Provides guidelines on the types of training recommended for ARFF personnel.

TABLE 10.1

ARFF-RELATED TRAINING REQUIREMENTS AND GUIDELINES
(continued)

Agency	Regulation/Guideline	Section	Relevance
National Fire Protection Association	NFPA 403 - Aircraft Rescue and Fire Fighting Services at Airports	§2.0 Organization of ARFF Services	Identifies airport responsibilities, emergency preparedness requirements, airport ARFF service categories and minimum number of ARFF vehicles.
		Appendix A Explanatory Material	Provides training program guidelines to meet NFPA 1003 qualification requirements.
	NFPA 1003 - Airport Fire Fighter Professional Qualifications	§3.0 Airport Fire Fighter	Establishes performance requirements for airport fire fighters including prerequisite knowledge and skills.
		Appendix A - Explanatory Material	Addresses the substitution of flammable gas for flammable liquid in training fires for environmental considerations.
		Appendix B - Aircraft Fire Suppression and Rescue Fire Training Mock-Up	Provides recommendations for various live fire training mock-ups.
	NFPA 1002 - Fire Department Vehicle Driver/Operator Qualifications	§7.0 Airport Rescue and Fire Fighting Apparatus	Identifies prerequisite skills for ARFF vehicle maneuvering and positioning.
	NFPA 30- Flammable and Combustible Liquid Code	Select sections	Provides design criteria for storage of flammable/combustible liquids
	NFPA 54 - Fuel Gas Code - National	Select sections	Provides criteria for installation of fuel gas piping systems
	NFPA 70 - Electrical Code - National	Select sections	Provides criteria for design of electric systems

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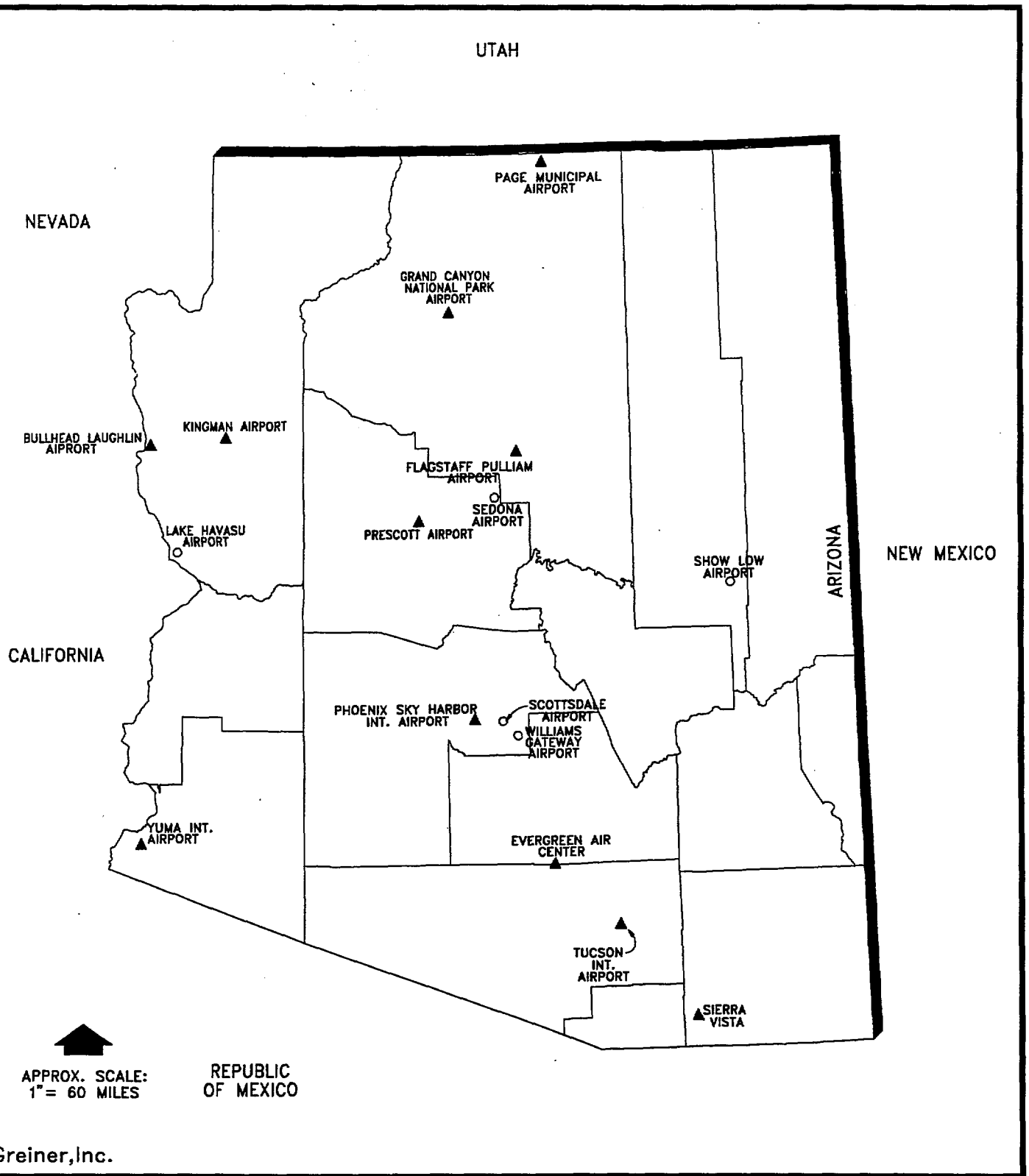
Information compiled by Greiner, Inc., 1995.



Greiner,Inc.

LEGEND

▲ FAR PART 139 Certificated Airports

○ Non-Certificated Airports with Commercial Service

ARIZONA DEPARTMENT OF TRANSPORTATION
AERONAUTICAL DIVISION

CERTIFICATED AND NON-CERTIFICATED AIRPORTS WITH COMMERCIAL SERVICE

FEASIBILITY STUDY AND ENVIRONMENTAL REVIEW FOR A REGIONAL ARFF TRAINING FACILITY

FIGURE 10.1

E0387C1\MAP.DWG\01.16.95

- Most airports would send less than 20 fire fighters and expect to allocate $500 to less than $100 per student.

- Anticipated travel distances would range between 100 to 300 miles, with central Arizona being the preferred location.

- Extinguishing agents would likely consist of a water/foam mixture or "water only" applied with trucks and handlines.

- The live fire simulator should include an aircraft fuselage and fuel spill, at a minimum; and there is no strong preference for a conventional fuel or propane facility.

10.2.2 Military

Because there are several military installations located within the state of Arizona that also require ARFF live fire training, their needs were also evaluated as part of this study. These installations include:

- U.S. Marine Corps Air Station - Yuma
- Davis-Monthan Air Force Base - Tucson
- Luke Air Force Base - Phoenix
- 161st Air National Guard - Phoenix
- 162nd Air National Guard - Tucson

Information obtained from interviews with personnel from these military installations revealed that in the short-term (less than 5 years), the demand for "off-base" ARFF training is potentially high. However, because the U.S. Air Force and Marine Corps have plans for their own ARFF training facilities, this demand is expected to diminish over time.

10.2.3 Out-Of-State Airports

Consistent with the concept of a regional ARFF training facility, the Aeronautical Departments and FAR Part 139 certificated airports in several neighboring states were also contacted in connection with this study. The results of this survey are summarized as follows:

- **Nevada** - The Washoe County Airport Authority is conducting a site selection and environmental review for a new ARFF training facility at Reno-Stead Airport. The Dodds-Beals Fire Training Academy is also building an aircraft live fire simulator.

- **Southern California** - The California Department of Transportation, Division of Aeronautics, is also conducting feasibility and site selection studies for ARFF training facilities. However, ARFF personnel from California indicated they would consider using a facility in Arizona if one is unavailable in their state.

- **Utah** - Site preparation and construction is reportedly underway for a new regional ARFF training facility at Salt Lake City International Airport.

- **Colorado** - The State's Aeronautics Division conducted an ARFF training facility feasibility and environmental review study in 1994. As a result, many ARFF personnel receive their live fire training under a civilian-military joint use facility located at Peterson Air Force Base in Colorado Springs.

- **New Mexico** - According to the State's Aeronautics Division, there are no current plans to conduct an ARFF feasibility and environmental review study. However, New Mexico is within the FAA region which contains the regional ARFF Training Facility at Dallas/Fort Worth International Airport and a non-aviation fire-training facility is located in Socorro.

Based on this information, it appears that the demand from out-of-state users for an ARFF training facility in Arizona is somewhat limited. Depending on the outcome of the Southern California study, ARFF personnel from this area and the State of New Mexico offer the most reasonable patronage from out-of-state airports.

10.2.4 Non-Aviation Users

This user group is generally characterized as being unaffiliated with aviation directly and includes industrial fire fighters; hazardous materials teams; and other Arizona-based federal, state and local fire departments.

For the purposes of this study, industrial fire fighters also include petrochemical, pipeline, and off-shore fire fighters. Unfortunately, the training, equipment, and simulators required for these students

are highly specialized. Therefore, this group was not considered to be a significant user of an ARFF training facility.

Hazardous materials response teams also require very specialized classroom and hands-on training. This group is commonly associated with the other non-aviation fire departments discussed below. As a result, this group of potential users was not separately considered.

Non-aviation-related fire fighters include those affiliated with county, city, and volunteer fire departments; the National Park and Forest Services; and Indian reservations. Because a large percentage of these fire fighters serve non-certificated airports and/or are often the first responders to "off-airport" aircraft incidents, the ARFF training needs for this group were seriously considered. According to the Arizona State Fire Marshal Office, there are approximately 10,000 fire fighters associated with 400 fire departments state-wide. From the results of this project's survey, it appears that there is a strong demand for ARFF live-fire training among these Arizona-based fire departments, provided it is affordable and conveniently located.

10.2.5 Existing and Future Demand

As previously stated, because the primary function of an ARFF training facility is to provide training to FAR Part 139 certificated airport ARFF personnel, this group is considered the "base line" demand for this project. The number of Arizona ARFF personnel that currently require this training is 177, not including Yuma International Airport.

Although there is no current requirement for general aviation ARFF personnel to have live fire training, there is a large amount of interest from this group. According to the survey, at least 200 of these fire fighters should be considered as potential users of an ARFF training facility.

With the exception of the USMC Air Station at Yuma, the other military ARFF personnel in Arizona must presently receive live fire training off-base. Approximately 292 of these fire fighters are located in Arizona, including the 130 at the Yuma Air Station.

Finally, using the results of the non-aviation fire department survey, there is a potentially significant demand for ARFF training from this group. From these data, roughly 588 of these fire fighters would likely use the facility, and another 1,148 may use the facility, if the cost is affordable.

In summary, the current demand for an ARFF training facility in Arizona is estimated as follows:

- Baseline Demand - 177 total fire fighters
- Include 200 General Aviation - 377 total fire fighters
- Include 292 Military - 669 total fire fighters
- Include 588 to 1,148 Non-Aviation - 1,257 to 1,817 total fire fighters

In order to assess the future potential demand for an ARFF training facility in Arizona, forecasted changes in Part 139 certification and ARFF indexes were also considered. Sources of information included the user surveys, future year aviation needs studies, select airport master plans, and interviews with airport managers. From this information, the future year "baseline demand" for and ARFF training facility in Arizona is approximately 252 Part 139 airport ARFF personnel.

10.3 ENVIRONMENTAL REVIEW

This task identified potential environmental concerns which may have an effect on the location, design and operation of an ARFF training facility in the State of Arizona. Discussed more thoroughly in the *First Draft Report*, this information was obtained from federal, state and local regulations; discussions with agency personnel; and the evaluation of other ARFF training facilities in Arizona and across the United States.

10.3.1 Regulatory Overview

On the federal level, important environmental compliance requirements are imposed by statutes such as the Clean Air Act (CAA), the Clean Water Act (CWA), and the National Environmental Policy Act (NEPA), promulgated by such agencies as the U.S. Environmental Protection Agency (EPA), Fish and Wildlife Service, and the Corps of Engineers (COE). These federal regulations involve the

protection of the natural and human environment; including fish and wildlife, wetlands, floodplains, farmlands, and historic and archaeological sites. In Arizona, many of these federal regulations are administered by state agencies, such as the Arizona Department of Environmental Quality (ADEQ) and the Arizona Department of Water Resources (ADWR). On the local level, Maricopa, Pinal and Pima Counties administer air quality programs sponsored by the ADEQ. Many counties and communities also have land use zoning plans that establish the type and mix of acceptable land uses within their jurisdictions.

10.3.2 Assessment of Impacts

A comprehensive summary of these federal, state, and local regulations as they potentially apply to an ARFF live fire training facility in Arizona, is provided in Table 10.2. Of these, the following issues related to air quality, water quality, and waste materials are of the greatest concern to environmental agencies.

10.3.2.1 Air Quality

Several areas within Arizona are designated as "non-attainment" with respect to the Ambient Air Quality Standards (AAQS). As a result of these designations, certain federal actions must demonstrate "conformity" with the State Implementation Plan (SIP) for these non-attainment areas. However, based on an air emissions inventory developed for this project (see Air Quality Technical Memorandum in Appendix A of the *First Draft Report*):

> "the annual emissions are below "de minimus" threshold levels (with one worst case exception), thus precluding the need for a conformity determination."

According to ADEQ, an ARFF live fire training facility will likely require an Open Burning Permit. Essentially, the ADEQ Open Burning Permit gives permission to "open burn," or create an "open outdoor fire," on a case-by-case basis [AAC, 1994]. Notably, these ADEQ rules allow:

TABLE 10.2

ENVIRONMENTAL REGULATIONS MATRIX

Regulations/Acts and/or Policies	Federal/State/ Local Agency	Relevance	Brief Discussion	Impact on ARFF Training Facility Project
Airport and Airway Improvement Act	Federal Aviation Administration (FAA)	Section 509 calls for assessment of human and environmental impacts for airport improvement projects.	Likely result in Categorical Exclusion or Finding of No Significant Impact	See NEPA discussion below
National Environmental Policy Act (NEPA)	FAA	Section 102 requires the evaluation of human and environmental impacts for certain federal actions.	NEPA requirements subject to FAA review through Categorical Exclusion, Environmental Assessment or Environmental Impact Statement.	Cost and time for environmental review process; anticipate Categroical Exclusion or Finding of No Significant Impact
Clean Water Act (CWA)	U.S. Environmental Protection Agency (EPA)	Sections 402 and 404 requires federal and/or state permits for the discharge of effluent to surface waters and the dredging or filling of navigable waters. Applys to both construction activities and industrial operations.	Section 402 National Pollutant Discharge elimination System (NPDES) permit may be required for effluent discharge during construction and operation.	See Discussion.
Safe Drinking Water Act	EPA	Prevents the discharge of effluent that would contaminate drinking water sources and establishes groundwater clean-up criteria.	FAA design standards provide for secondary containment and effluent treatment or disposal at ARFF Facilities.	None expected; no planned discharges of effluent to groundwater.
Clean Air Act (CAA)	EPA	Establishes ambient air quality standards; regulates hazardous air pollutants; and requires federal actions demonstrate SIP conformity in nonattainment areas.	ADEQ and Maricopa, Pima and Pinal County agencies responsible for protecting air quality in Arizona. Emissions below "demmimus" levels so SIP conformity not required.	Discontinued use of halon. See Discussion.

TABLE 10.2

ENVIRONMENTAL REGULATIONS MATRIX
(continued)

Regulations/Acts and/or Policies	Federal/State/ Local Agency	Relevance	Brief Discussion	Impact on ARFF Training Facility Project
Resource Conservation and Recovery Act (RCRA)	EPA	Regulates the use, handling, treatment and disposal of solid and hazardous waste; and the use of underground storage tanks (UST).	Petroleum-based fuels are exempt from most RCRA requirements unless spills or leaks occur.	USTs must meet design standards; burn pit sludge requires testing
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	EPA	Requires spills of reportable quantities to be reported and remediated by responsible parties.	Spills of fuels and foam resulting in contamination must be addressed	None expected unless spill or leak occurs
Superfund Amendments and Reauthorization Act (SARA)	EPA	Reauthorized CERCLA and established Emergency Planning and Community Right-To-Know Programs	Limited use of hazardous substances likely precludes involvement	None expected.
Occupational Safety and Health Act	Occupational Safety and Health Administration (OSHA)	Requires Material Safety Data Sheets be provided	MSDS for fuel and AFFF need to be posted on-site	None expected.
Endangered Species Act	U.S. Fish and Wildlife Service (USFWS)	Prevents federal projects from affecting endangered species or their habitat	Size of facility footprint can help avoid or minimize involvement; addressed in NEPA documentation.	None expected.
Fish and Wildlife Coordination Act	FWS	Requires consultation with federal/state wildlife agencies when federal projects affect water bodies	Size of facility footprint can help avoid or minimize involvement; addressed in NEPA documentation.	None expected.
National Historic Preservation Act	State Historic Preservation Office (SHPO)	Section 106 requires federal projects address effects on National Register of Historic Places sites.	Size of facility footprint can help avoid or minimize involvement; addressed in NEPA documentation.	None expected.
Department of Transportation Act	Department of Transportation (DOT)	Section 4(f) lands used for recreation must be avoided.	Size of facility footprint can help avoid or minimize involvement; addressed in NEPA documentation.	None expected.

TABLE 10.2

ENVIRONMENTAL REGULATIONS MATRIX
(continued)

Regulations/Acts and/or Policies	Federal/State/ Local Agency	Relevance	Brief Discussion	Impact on ARFF Training Facility Project
Wild and Scenic Rivers Act	National Park Service	Directs federal actions to avoid or mitigate adverse effects on rivers listed in the Nationwide Inventory	Size of facility footprint can help avoid or minimize involvement; addressed in NEPA documentation.	None expected.
Federal Farmlands Protection Policy Act	Department of the Interior	Requires federal projects address the conversion of farmland to nonagricultural uses.	Size of facility footprint can help avoid or minimize involvement; addressed in NEPA documentation.	None expected.
Archaeological and Historic Data Preservation Act	SHPO	Requires federal projects address the potential loss and preservation of historic and archaeological data.	Size of facility footprint can help avoid or minimize involvement; addressed in NEPA documentation.	None expected.
Federal Land Policy and Management Act	F	Requires consultation with Bureau of Land Management if the site of the federal project is being considered for the National Wilderness System	Size of facility footprint can help avoid or minimize involvement; addressed in NEPA documentation.	None expected.
Arizona Administrative Codes	Arizona Department of Environmental Quality (ADEQ)	Title 18, Chapter 8 - Waste Management Rule Article 2: Hazardous Wastes, establishes criteria for storage use and disposal of hazardous wastes in Arizona.	See RCRA discussion above.	None expected.
		Title 18, Chapter 9 Water Pollution Control - Article 1: Aquifer Protection, requires permits for discharges to groundwater.	Discharges to groundwater not planned.	None expected.

TABLE 10.2
ENVIRONMENTAL REGULATIONS MATRIX
(continued)

Regulations/Acts and/or Policies	Federal/State/ Local Agency	Relevance	Brief Discussion	Impact on ARFF Training Facility Project
Arizona Administrative Codes	Arizona Department of Environmental Quality (ADEQ)	- Article 7 Wastewater Reuse requires permits for application of reclaimed wastewater. Title 18, Chapter 11 Water Quality Boundaries and Standards	Application of reclaimed wastewater unlikely.	None expected.
		- Article 1: Water Quality Standards, establishes water quality standards for navigable waters of the state.	Discharges to surface water not planned; NPDES permit will address.	See Discussion.
		-Article 2: Discharge Limitations establishes limitations on discharge of pollutants to navigable waters.	Discharges to surface water not planned; NPDES permit will address.	See Discussion
		- Article 4: Aquifer Water Quality Standards defines standards and sampling methods for groundwaters	Discharges to groundwater not planned.	None expected.
		- Article 5: Aquifer Boundary and Protected Use Classifications identifies aquifer exclusion areas and classifies aquifer types.	Discharges to groundwater water not planned.	None expected.

TABLE 10.2

ENVIRONMENTAL REGULATIONS MATRIX
(continued)

Regulations/Acts and/or Policies	Federal/State/ Local Agency	Relevance	Brief Discussion	Impact on ARFF Training Facility Project
Arizona Administrative Codes	Arizona Department of Environmental Quality (ADEQ)	Title 18, Chapter 12: Underground Storage Tanks describes underground storage tank regulations.	USTs will be designed and installed meet criteria. or above ground tanks will be used	See Discussion.
		Title 18, Chapter 2 Air Pollution Control Standards identifies air quality standards, permit requirements and new source performance standards. ARFF Facilities exempt from permitting.	Violation of standards not expected. See CAA discussion.	Limited or no use on "no burn" days.
	Arizona Department of Water Resources	Title 12, Chapter 15, Article 8: Well Construction establishes requirements for well construction.	Source of water likely from utility; any production wells will need permit.	See Discussion.
Maricopa County Administrative Code	Maricopa County Division of Air Pollutiion Control	Air Pollution Conrol Regulations establishes counties non-attainment status and applicable standards.	Williams Gateway site within non-attainment area; permits not required; pollution-alert days may restrict use.	See Discussion.
Pima County Administrative Code	Pima County Department of Public Works	Title 17 Air Quality Control establishes county's non-attainment status and applicable standards	Tucson Public Safety site within non-attainment area; permits not required; pollution-alert days may restrict use.	See Discussion.
Pinal County Administrative Code	Pinal County Air Quality Control District	Article 7 Rules and Regulations identifies permit requirements and emission standards	Evergreen Airpark Site located in Pinal County.	None expected.

> "open burns ... by any public officer in the performance of official duty...for the purpose of ... instruction in the methods of fighting fires."

The permit sets limitations on the manner and time of setting the fires and allows prohibition of burning when atmospheric conditions are not conducive to smoke dispersion or when visibility impairment could affect public safety. In spite of the assurance that a regional ARFF training facility would be permitted in this manner, further discussions with ADEQ, or appropriate county agencies, would be required after the site(s) and technology are formally selected for this project. The subject of these discussions should be the acceptability of the periodic dense dark plumes of smoke that are characteristic of ARFF live fire training facilities.

10.3.2.2 Water Quality

AC 150/5220-17A, discussed previously, recommends that the design of ARFF training facilities contain various environmental safeguards (i.e., secondary containment, leak detection systems, and effluent treatment) to address water-related environmental concerns. In addition, Section 402 of the CWA requires a National Pollution Discharge Elimination System (NPDES) permit from EPA for the discharge of effluent to a navigable water. Any unavoidable dredging or filling of wetlands will require a CWA Section 404 (Dredge and Fill) permit from the COE. These permits can be avoided by discharging effluent to a sanitary sewer and avoiding wetlands.

In all cases, an Aquifer Protection Permit (APP) from ADEQ will be required for an ARFF training facility. In order to obtain an APP permit:

> "the applicant must demonstrate that the facility will be designed, constructed and operated as to ensure the greatest degree of discharge reduction achievable through the application of the Best Available Demonstrated Control Technology, equivalent processes, operating methods or other alternatives."

Essentially, the discharge must not cause, or contribute to, a violation of an aquifer water quality standard.

10.3.2.3 Waste Materials

The Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response and Compensation Liability Act (CERCLA) primarily deal with hazardous materials and hazardous waste. Hydrocarbon-based fuels (including jet fuel, JP-4, and propane) are exempt from most of the requirements contained in these statutes. However, the storage of fuel in underground tanks is regulated by RCRA, or by equivalent state regulations. Also under RCRA, the removal of accumulated sludge in the burn pit may require testing in order to characterize the material's chemical make-up before disposal.

Under CERCLA, any contamination of the soil, surface water, or groundwater, including the result of fuel spills or leaks, must be reported to the National Response Center and/or ADEQ. In addition, the cause of the contamination, or the source of the spill, must be immediately addressed and the environmental impacts mitigated.

Because it is unlikely that any hazardous or toxic substances will be stored, or utilized, at an ARFF training facility in large quantities, regulatory agency reporting requirements, under the Emergency Planning and Community Right-to-Know Act, will not apply, unless there is a spill or release of regulated substances.

In the State of Arizona, owners of underground storage tanks (UST's) must notify ADEQ in order to register the UST's and to inform ADEQ of any changes in ownership, facility status, or problems. In addition, owners or operators of UST's must demonstrate their ability to pay for contamination clean-up if their tanks leak. UST's must be properly installed and protected from spills, overflows, and corrosion. Leak detection equipment is also required.

10.3.2.4 Other Impacts

Because the "footprint" of an ARFF training facility is less than 10 to 20 acres, most of the potential impacts to fish and wildlife, wetlands, floodplains, farmlands, and historic or archaeological sites can be avoided or easily mitigated.

Many counties and communities also have land use zoning plans that establish the type and mix of acceptable land uses within their jurisdictions. However, because ARFF training facility sites are located at airports, at military bases, or in otherwise remote locations, conflicts with local zoning requirements will be minimized.

10.4 FACILITY SITE SELECTION

The purpose of this task was to identify several potential ARFF training facility site locations within Arizona. The suitability of these sites was also assessed in terms of their ability to successfully support an ARFF training facility. Based on this information, the sites were ranked in order of preference.

10.4.1 Potential Sites

Sources of information used to identify ARFF training facility sites included the ADOT Department of Aeronautics, the ARFF Study Committee, the user surveys conducted during Task 2 and Greiner, Inc. personnel associated with this project.

Several areas of the state were also considered to be incompatible with an ARFF training facility because of land use, environmental, or other geographic factors. These areas include national and state parks, forests, and monuments; designated wilderness areas and wildlife refuges; military-proving grounds; mountainous areas or regions of significant topographic relief; residential areas; and areas inaccessible by roads.

From this information, eight sites were identified as being potentially suitable locations for an ARFF training facility in Arizona. Shown on Figure 10.2, these sites included the following:

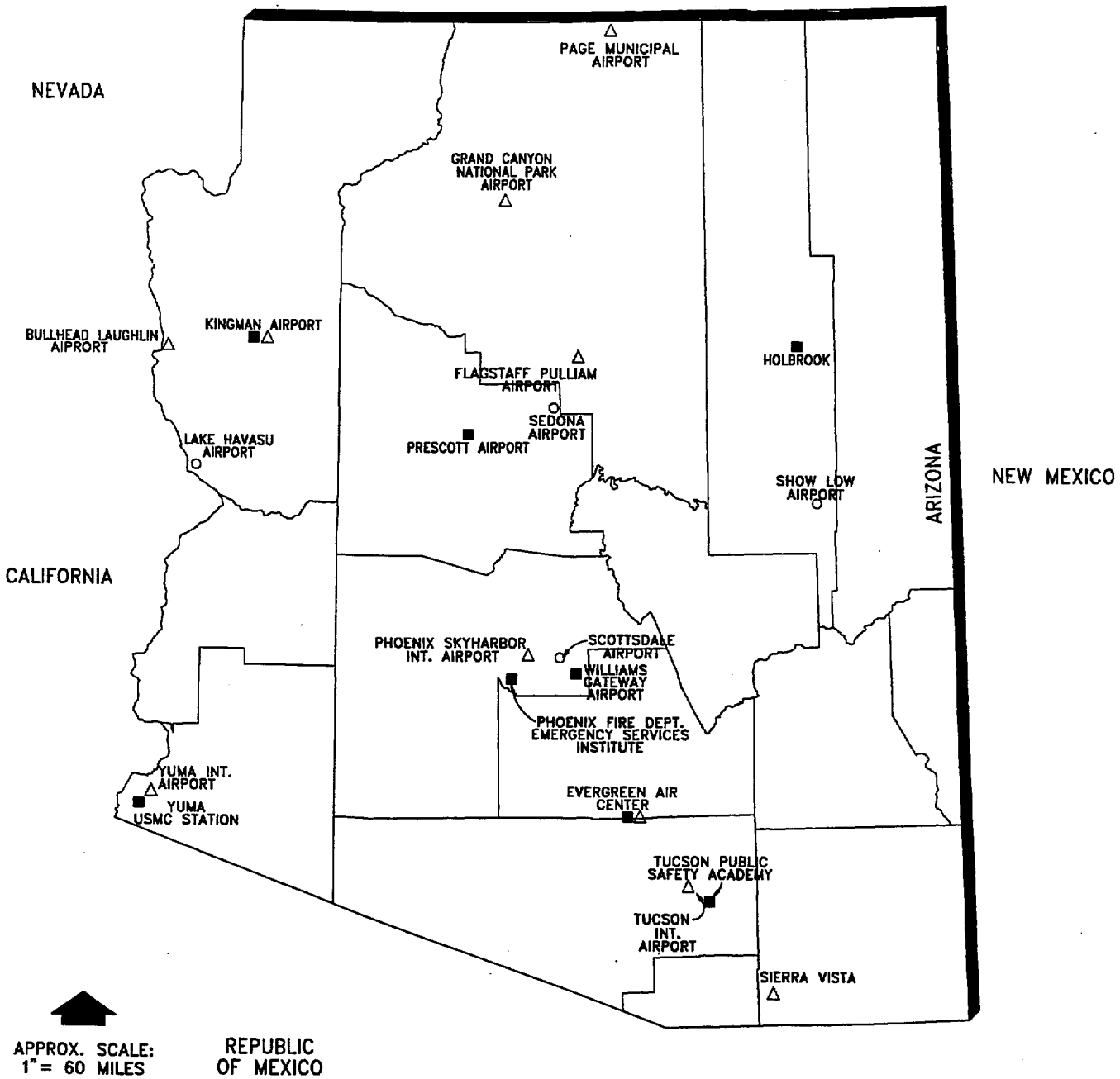
- Evergreen Air Center
- Holbrook
- Kingman Airport
- City of Phoenix Emergency Services Institute
- Prescott Airport
- Tucson Public Safety Academy
- Williams Gateway Airport
- Yuma U.S. Marine Corps Air Station

Six of these sites (i.e., Evergreen, Kingman, Prescott, Tuscon, Williams Gateway and Yuma) were identified early in the study and discussed in detail in the *First Draft Report*. The two remaining sites (Holbrook and the City of Phoenix Emergency Services Institute) were identified and evaluated later. Therefore, the descriptive and other supporting materials for Holbrook and City of Phoenix Emergency Services Institute sites are contained in Appendix I of this report.

10.4.2 Evaluation Methodology

In order to evaluate the overall suitability of the eight individual sites as regional ARFF training facilities, a set of 18 criteria were developed by the Study Committee and Greiner, Inc. team members. Each criterion is considered important to a successful regional ARFF training facility. These criteria are briefly discussed below:

- **Willing Host** - The demonstrated willingness of site owner/operator to accommodate an ARFF training facility.
- **Land Availability** - The availability and overall suitability of land to support a facility taking into consideration size, terrain, obstructions, etc.
- **Land Use** - The compatibility of existing and future land use at the site and adjoining property.
- **Travel Distance** - The roadway driving distance between the Part 139 airports and the site, multiplied by the number of fire fighters from each airport.



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LEGEND

- ■ Potential ARFF Training Facility Sites
- △ FAR PART 139 Certificated Airports
- ○ Non-Certificated Airports with Commercial Service

ARIZONA DEPARTMENT OF TRANSPORTATION
AERONAUTICAL DIVISION

POTENTIAL ARFF TRAINING FACILITY SITES

FEASIBILITY STUDY AND ENVIRONMENTAL REVIEW FOR A REGIONAL ARFF TRAINING FACILITY

FIGURE 10.2

E0387C1\MAP.DWG\01.16.95

- **Distance to Other ARFFs** - The approximate distance between the Arizona Part 139 airports and out-of-state regional ARFF facilities that would provide comparable training.

- **Environmental and Geographic Factors** - The potential to impact or conflict with a wide variety of environmental issues including air quality; surface and ground water; biotic communities; preserved or historic sites; aesthetics; and other areas of federal, state, or local importance.

- **Community Acceptability** - The apparent willingness of a community to support a regional ARFF training facility and tolerate the associated smoke, fire, traffic, etc.

- **Educational Support** - The availability of training courses, qualified instructors, and educational institutions involved in aviation, fire fighting and/or emergency response.

- **Lodging/Meals/Recreation Facilities** - The availability of local and affordable lodging, restaurants and recreation for overnight visitors.

- **Commercial Air Service** - The availability of commercial air carrier service to the site or a nearby airport.

- **Complementary Use Facilities** - The existence of other aviation, fire fighting and/or emergency service facilities that would complement, or be complemented by, an ARFF facility.

- **Utilities** - The availability of electricity, storm and sanitary sewer, telephone, water, wastewater treatment or any other utilities used to support an ARFF facility.

- **Ground Access** - The ability to access/egress the site with heavy fire fighting equipment taking into consideration the use of public/private roads, crossing active airfields, etc.

- **Existing Support Facilities** - The existence of fire fighting facilities, equipment, and trainers; equipment/vehicle maintenance/storage facilities; classrooms; and other fire fighting/rescue training aids.

- **Emergency Services** - The availability of a hospital, clinic, EMS, police/fire departments, etc. in the event these services become necessary in connection with an accident or emergency.

- **Utilization Restrictions** - Any restrictions or impediments to the use of the site and ARFF training facility taking into consideration seasonal/weather factors, environmental factors, and/or other conflicts.

- **Miscellaneous Factors** - Any other factors, positive or negative, not described above that could have an effect on the location, design, construction, and use of an ARFF training facility.

- **Cost Savings** - The amount of construction and operational funds saved by the availability of existing and/or planned complimentary use and support facilities.

Table 10.3 contains a Site Evaluation Matrix summary of information, data, and observations that were used to characterize each of the eight potential ARFF training facility sites with respect to the 18 evaluation criteria. This information was collected, or developed, by Greiner, Inc. personnel from the user survey results, site visits, interviews, etc., performed in support of this feasibility study/environmental review.

10.4.3 Site Rankings

Using the Site Evaluation Matrix as a guide, the ARFF Study Committee members evaluated the eight potential host sites during two scheduled committee meetings. Each of the 18 evaluation criteria were preassigned a numerical weighting factor (1 through 3) reflecting its relative importance in support of a successful ARFF training facility. Similarly, each site was assessed a numerical value (1 through 3) in terms of its ability to satisfy the criteria. The computed scores from each of the Committee members were then combined and averaged to rank the sites in order of desirability (see Appendix J for Site Evaluation Supporting Materials).

Table 10.3 also contains the results of the Site Ranking process. In descending order, they are Tucson, Williams Gateway, Phoenix, Yuma, Evergreen, Holbrook, Kingman, and Prescott. The three highest ranked sites: the Tucson Public Safety Academy, Williams Gateway Airport, and the City of Phoenix Fire Department Emergency Services Institute (ESI) are described below. For brevity, the five lower ranked sites are not further described.

TABLE 10.3

SITE EVALUATION MATRIX

	ALTERNATIVES							
Evaluation Criteria	**Evergreen**	**Holbrook**	**Kingman**	**Phoenix**	**Prescott**	**Tucson**	**Williams Gateway**	**Yuma**
Willing Host	Evergreen Air Center	City of Holbrook	Kingman Airport Authority	City of Phoenix	City of Prescott	Tucson Public SafetyAcademy	Williams Gateway Airport	U.S. Marine Corps
Land Availability	Adj. to N.E. flight line	Adjacent to airport	North end of airport	Adjacent to Training Academy (private ownership)	East or N. E. end of airport	On-site	a. N.W. sector b. S.E. sector	On Air Station (undetermined)
Land Use	Aviation	Aviation	Aviation and Industrial	Agricultural	Aviation , Institutional and Commercial	Institutional	a. Education/Research - Aviation b. Industrial - Aviation	Institutional - Military
Travel Distance (person-miles-traveled)	29,353	45,273	41,621	28,000	32,775	33,743	28,165	50,769
Distance to Nearest Regional ARFF	700 miles (Salt Lake City)	601 miles (Salt Lake City)	525 miles (Salt Lake City)	650 miles (Salt Lake City)	550 miles (Salt Lake City)	750 miles (Salt Lake City)	650 miles (Salt Lake City)	675 miles (Reno)
Environmental Impacts a. Air b. Surface/Groundwater c. Plant/Animal d. Other	a. Attainment Area b. Minimal c. Minimal d. None anticipated	a. Attainment area b. Minimal c. Minimal d. None anticipated	a. Attainment area b. Minimal c. Minimal d. None anticipated	a. Non-Attainment area b. Minimal c. Minimal d. None anticipated	a. Attainment area b. Minimal c. Minimal d. None anticipated	a.Non-attainment b. Minimal c. Minimal d. None anticipated	a. Non-attainment area b. Minimal c. Minimal, covered with grass d. Potential archaeological areas at S.E. site	a. Non-attainment b. Minimal c. Minimal d. None anticipated
Community Acceptability	Good (remote location)	Good; accept existing fire training facility	Marginal to good (remote location but widely visible)	Marginal to Good	Marginal to good	Good	Marginal at N.W. site; adj. to golf course and housing) Good at S. site	Good; accept existing ARFF
Training/Education Support	Central Arizona College	Holbrook Fire Department training Center/Northland Pioneer College	Mohave Community College	Emergency Services Institute, Phoenix College, Arizona State, Ottawa University	Embry-Riddle University	Public Safety Academy	ASU, UND, MCCO, State Fire Marshall	Arizona Western College, USMC
Lodging/Meals/ Recreation	Available on-site	Commercially available	Commercially available nearby	Commercially available nearby	Commercially available nearby	Commercially available nearby and on-site in future	Available on-site	Commercially available nearby
Commercial Air Service	Available at Tucson Airport	Available at Flagstaff	Available on-site	Available at Sky Harbor	Available on-site	Available at Tucson Airport	Available at Sky Harbor, will be available on-site	Available on-site
Complimentary Use Facilities	DOD aircraft trainer and vehicle driving course	Holbrook Airport and Fire Department Training Center	Hualapai Valley Fire Department	Emergency Services Institute	Embry-Riddle University Accident Investigation Laboratory and U.S. Forest Service Facility	Public Safety Academy Simulators and Mock-ups	Planned State Fire Marshall Training Center; MCCD fire training program; aviation-related manufacturing, research and education	Yuma Airport and USMC Station
Ground Access	Accessible by on-site roadways	Accessible by on-site roadeays	Accessible by on-site roadways	Accessible by off-site roadways	Likely on-site	Accessible by on-site roadways	Accessible by on-site roadways	Likely on-site

(Continued on next page)

TABLE 10.3

SITE EVALUATION MATRIX
(Continued)

	ALTERNATIVES							
Evaluation Criteria	**Evergreen**	**Holbrook**	**Kingman**	**Phoenix**	**Prescott**	**Tucson**	**Williams Gateway**	**Yuma**
Existing Support Facilities	Classrooms, offices, smoke trainer, vehicle driving course	Holbrook Fire Department facilities	Hualapai Valley Fire Department	Classrooms, offices, vehicle driving course, and training personnel associated with Emergency Services Institute	Classrooms, cafeteria dormitories at Embry-Riddle University	Public Safety Academy Facility	Classrooms, dormitories offices, storage buildings	USMC trucks and equipment, classrooms
Utilities a. Water b. Sewer c. Electric	a. Within 200' of site b. Within 300' of site c. Within 300' of site	a. Near planned service b. Likely nearby c. Near planned service	a. Within 300' of site b. Within 300' of site c. On-site	a. Likely nearby b. Likely nearby c. Likely nearby	a. Within 300' of site b. Within 300' of site c. Within 300' of site	a. On-site b. On-site c. On-site	a. Near 12" line b. Near 10" - 12" line c. Near planned service	a. Likely nearby b. Likely nearby c. Likely nearby
Emergency Service	Available in Tucson	Available in Winslow, Show Low & Flagstaff	Available in Kingman	Available in Phoenix	Available in Prescott	Available in Tucson	Planned on-site and available in Mesa/Phoeniz	Available on base and in Yuma
Utilization Restrictions	None anticipated	None anticipated.	None anticipated	Potential restirictions on air pollution alert days	None anticipated	Potential restrictions on air pollution alert days	Potential restrictions on air pollution alert days	Two 8-week periods during USMC training
Miscellaneous Factors	AIP funds may be restricted	None	None	Requires land purchase	None	Non-aviation host	None	Will require state/ federal joint-use agreement
Cost Savings	$200,000	Minimal	Minimal	$200,000	Minimal	$570,000	$210,000	$200,000
Total Points	87.5	84.5	82.6	90.4	69.2	96.9	92.5	90.3
Ranking	5	6	7	3	8	1	2	4

Information compiled by Greiner, Inc., 1995.

- **Tucson Public Safety Academy (Ranked First - 96.9 Total Points)**

  The Public Safety Academy is a joint venture between the Tucson Fire and Police Departments. As shown on Figure 10.3, the entire site covers 150 acres, located four miles south of I-10 near a state and federal prison. The area is remotely located, essentially undeveloped, and zoned for institutional and commercial uses.

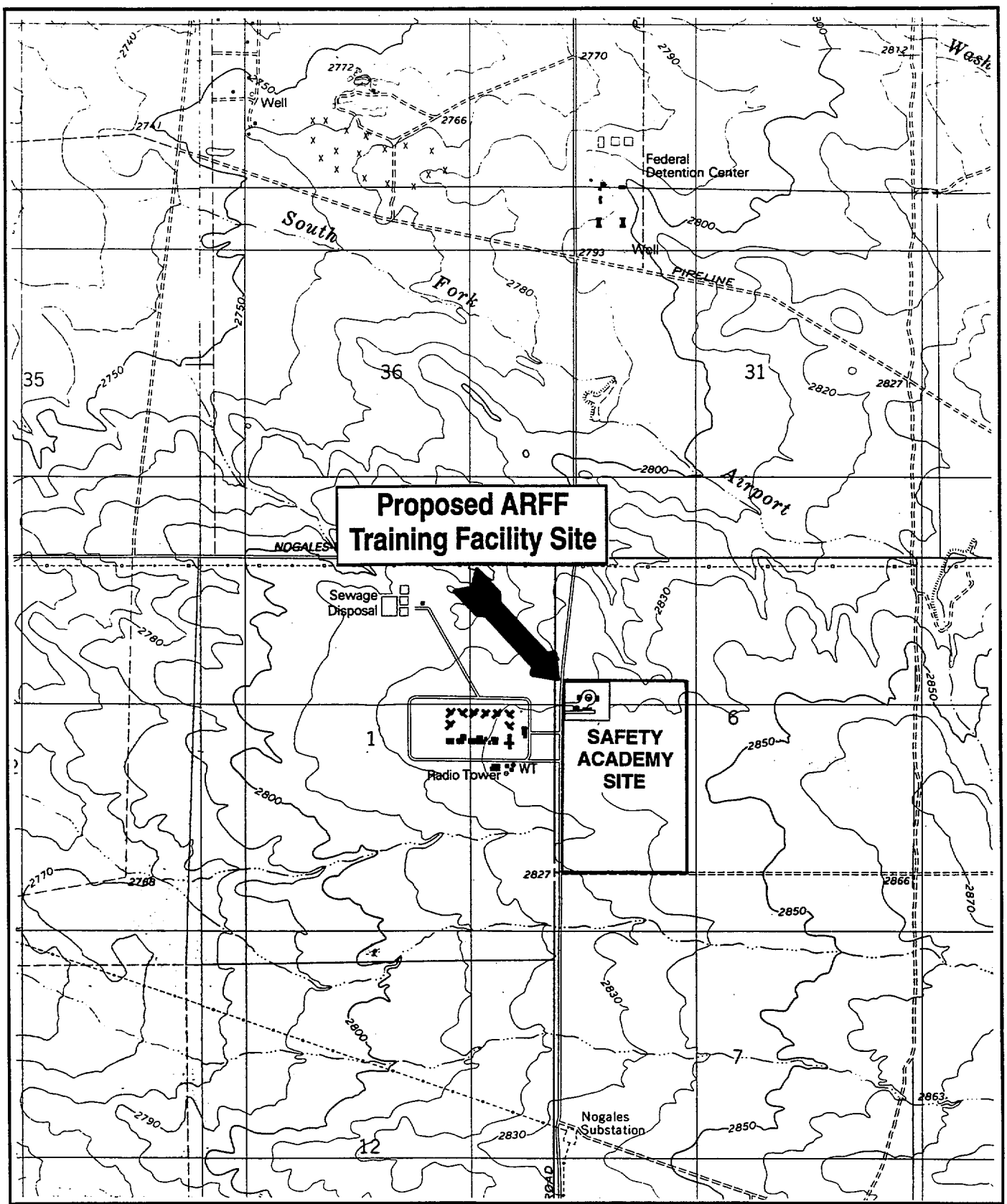
  The Public Safety Academy is presently constructing a new training facility at this location which will consist of an office building, classrooms, locker/shower rooms, 10-acre driver training pad, and a "situational village." A police firing range already exists. Planned fire training props include a burn building, confined-space simulator, LPG tank, railroad prop, and a flammable liquid pit fueled with natural gas. Utilities include electricity and sewer. Water will be provided from an on-site well supplemented with "recycled" water used for fire training. Future plans for the facility call for dorms, dining facilities, and recreational facilities. The ARFF live fire simulator would likely be located in the northwest corner of the Academy site, on a parcel that has been reserved for future expansion.

- **Williams/Gateway Airport (Ranked Second - 92.5 Total Points)**

  Located at the former Williams Air Force Base in Mesa, this facility is in eastern Maricopa County, approximately 25 miles from downtown Phoenix and is five miles south of the Superstition Freeway (U.S. 60). The area immediately surrounding Williams is agricultural. Nearby communities include Mesa, Gilbert, and Queen Creek. Presently, the Williams facility covers 4,000 acres of land and contains 200 buildings and 3 runways. The Williams Gateway Airport Authority has developed reuse plans for Williams that involve aviation; aerospace-related industry, research, and training; and education.

  As shown on Figure 10.4, there are two undeveloped parcels located in the northwest and southern sections of the airport that may be suitable for an ARFF training facility. Williams Gateway also offers an on-site wastewater treatment plant, a number of existing classrooms, office space, dormitories, a cafeteria, recreational facilities, and driver training area which could be utilized in support of an ARFF training facility.

  The reuse plans also include an aeronautical educational consortium composed of Arizona State University, the University of North Dakota Aerospace Foundation and the Maricopa Community College District (MCCD). In conjunction with the MCCD Emergency Medical Technology and Fire Science Program, the Arizona State Fire Marshall Office is planning to develop a fire fighting training facility at Williams Gateway. Using state and county funds, the facility will lease existing office, classroom, and dormitory space near the

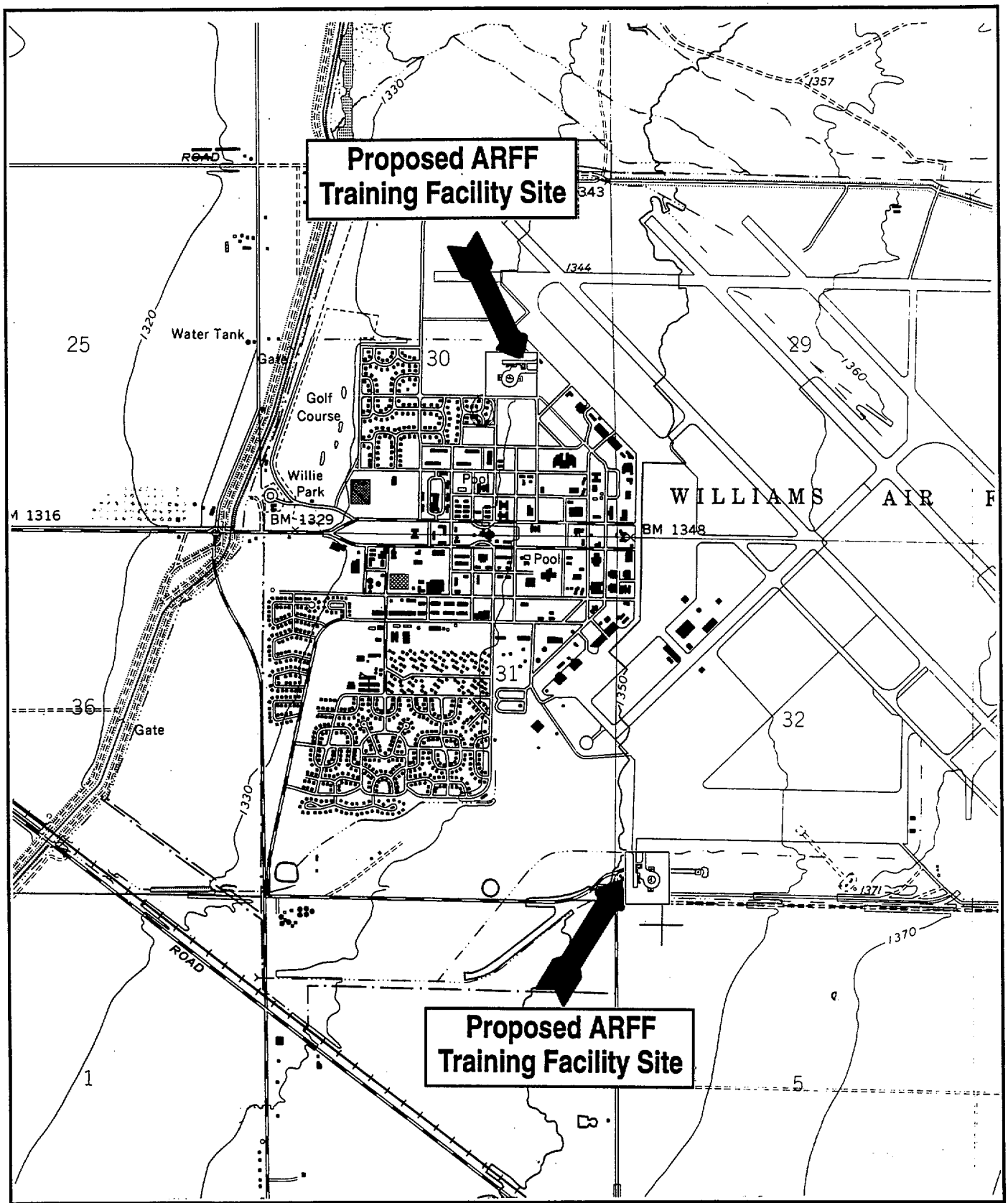


ARIZONA DEPARTMENT OF TRANSPORTATION
AERONAUTICAL DIVISION

TUCSON PUBLIC SAFETY ACADEMY

FEASIBILITY STUDY AND ENVIRONMENTAL REVIEW FOR A REGIONAL ARFF TRAINING FACILITY

FIGURE 10.3



ARIZONA DEPARTMENT OF TRANSPORTATION
AERONAUTICAL DIVISION

WILLIAMS GATEWAY AIRPORT

FEASIBILITY STUDY AND ENVIRONMENTAL REVIEW FOR A REGIONAL ARFF TRAINING FACILITY

FIGURE 10.4

northeast flightline. A drill tower, a propane-fueled burn building, and confined space/trench rescue simulators will be added. An ARFF training facility has also been considered.

- **Phoenix Fire Department Emergency Services Institute (ESI)**
  (Ranked Third - 90.4 Total Points)

  The Phoenix Fire Department Emergency Services Institute (ESI) is located in south-central Phoenix near the intersection of 22nd Avenue and Lower Buckeye Road.

  The ESI presently serves as a training facility for the City of Phoenix and other municipal fire departments. Training is conducted in several class and simulator rooms. An 85-seat auditorium is also available. Various fire fighting props include two burn buildings, a railroad tank car, two LPG tanks, an aboveground fuel tank, a smoke trainer, and confined space manhole. The live fire props are fueled with propane, and Class A combustibles are used in the burn buildings.

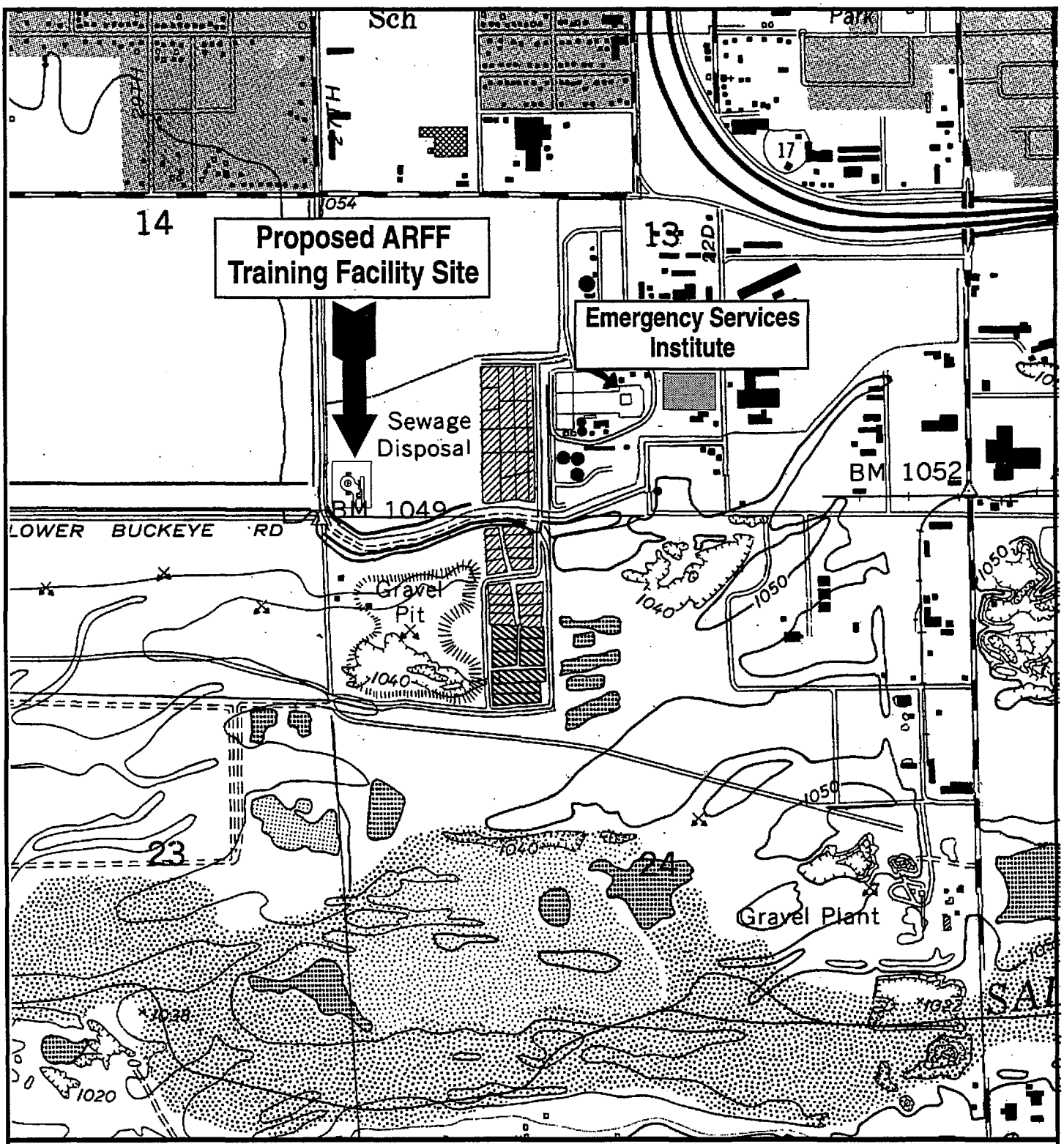
  Training officers and staff are members of the Phoenix Fire Department. Other training aids include a video library, satellite tele-broadcast capability and a variety of fire fighting/emergency rescue equipment. The training program is accredited by the State Fire Marshall's Office. The Department is also affiliated with the Phoenix College Fire Management and Technology Program.

  As shown on Figure 10.5, the proposed ARFF training facility site is located less than one-half mile southwest of the ESI. The 30-acre parcel is currently used for agriculture and is privately owned. Access is available on 27th Avenue and Lower Buckeye Road.

  Surrounding land uses include a City landfill/recycling plant, a wastewater treatment plant, ADOT and City of Phoenix vehicle storage maintenance facilities and additional agricultural fields. The nearest residential areas are about one mile away, near I-17.

  Commercial air service is available at nearby Sky Harbor International Airport and hotel/restaurant facilities are located within a few miles of the site.

  Notably, the Phoenix Fire Department currently provides ARFF services to Sky Harbor International Airport. Between 1989 and 1991, the Department also developed some preliminary plans for building and managing an ARFF training facility in connection with the ESI.



ARIZONA DEPARTMENT OF TRANSPORTATION
AERONAUTICAL DIVISION

CITY OF PHOENIX FIRE DEPARTMENT EMERGENCY SERVICES INSTITUTE

FEASIBILITY STUDY AND ENVIRONMENTAL REVIEW
FOR A REGIONAL ARFF TRAINING FACILITY

FIGURE 10.5

Additional information on the Tucson Public Safety Academy and Williams Gateway sites can be found in Appendix B of the *First Draft Report*. Additional information on the Phoenix Fire Department ESI site is contained in Appendix I of this report.

10.5 AVAILABLE TECHNOLOGY

The purposes of this task were to identify and describe the major components (i.e., equipment, hardware, support systems, etc.) of an ARFF training facility and to evaluate the available technologies for meeting these requirements. More thoroughly addressed in the *First Draft Report*, this information was used by the Committee in support of their recommendations for the design and operation of an ARFF training facility in Arizona.

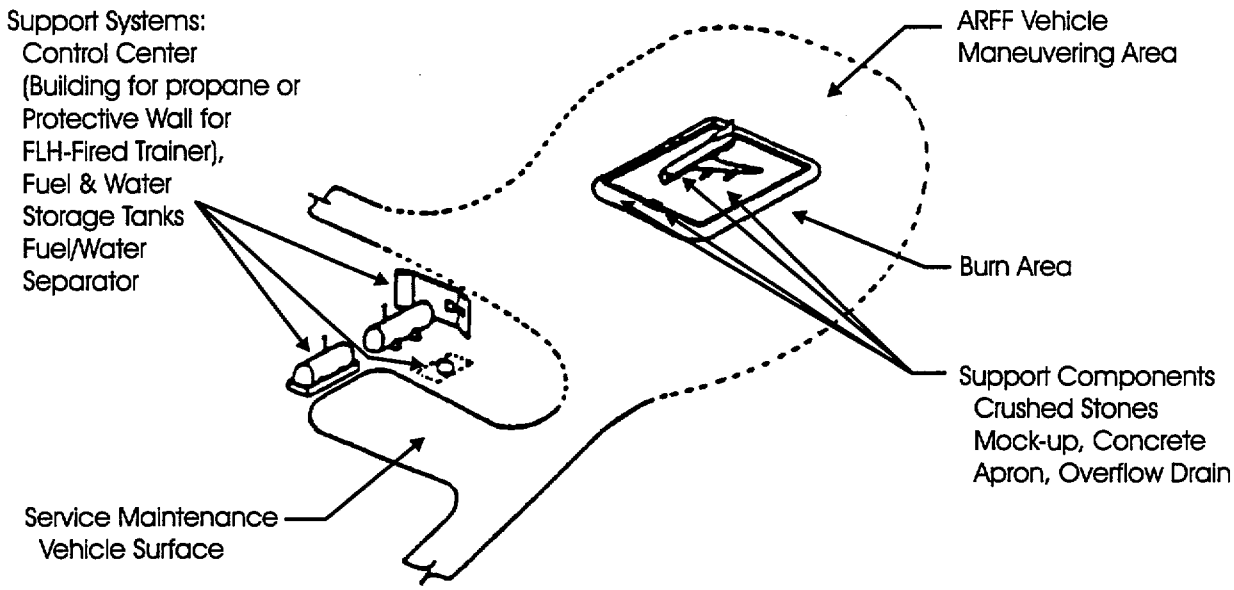
10.5.1 Facility Components

According to AC 150/5220-17A, *Design Standards for an Aircraft Rescue and Fire Fighting Training Facility*, an ARFF training facility is composed of the burn area, the vehicle maneuvering area and an assortment of support equipment including the mock-up(s), control center, fuel/water storage tanks and a wastewater treatment system. These components are generally illustrated in Figure 10.6 and are briefly discussed below:

- **Burn Area** - This is the structure within which the live fire is conducted. The basic design consists of a floor surrounded by a wall, or berm, made of concrete or other impervious materials. In some cases, this structure is partially filled with crushed stones and water and is also referred to as the "fire pit".

- **Vehicle Maneuvering Area** - This flat surface surrounds the burn area and provides a platform upon which the fire fighters can approach the fire with their vehicles and equipment. This surface is usually constructed of concrete, crushed stone or gravel.

- **Mock-Up(s)**- This metal structure is located within the burn area and serves to simulate an aircraft or various aircraft components. In most cases, a metal cylinder is used to represent the fuselage, and the other components are individually fabricated to simulate an aircraft wing, landing gear, engine, auxiliary power unit, etc.



From AC 150/5220-17A

ARIZONA DEPARTMENT OF TRANSPORTATION
AERONAUTICAL DIVISION

ARFF TRAINING FACILITY BASIC COMPONENTS

FEASIBILITY STUDY AND ENVIRONMENTAL REVIEW FOR A REGIONAL ARFF TRAINING FACILITY

FIGURE 10.6

- **Control Center** - Located outside the burn and vehicle maneuvering areas, this structure can serve several purposes. Fire fighters not engaged in the live fire and the instructors are usually located here with a complete view of the burn area. In some cases, the structure also provides protection to other support equipment such as fuel/water storage tanks, wastewater treatment systems, valve boxes and electrical equipment.

- **Fuel/Water Storage Tanks** - Depending on the type of fuel used at the training facility, the fuel tanks contain either jet fuel, JP-4 or propane. Typically, these tanks range in size from 5,000 to 20,000 gallons and both underground and above ground tanks are used. Similar, but separate, tanks are used to store wastewater.

- **Wastewater Treatment System** - In the case of liquid flammable fuels, this system typically consists of a catch basin, an oil/water separator and one or more of the following: carbon filters, sand filters, evaporation pond and a wastewater treatment plant. When using propane, the wastewater treatment system requirements are reduced substantially.

Other components of an ARFF training facility likely include an access road, parking lot, vehicle/equipment storage and classroom buildings, security fence, water well, and other training mock-ups. Table 10.4 comprises a listing of ARFF training facility components with a summary of their intended functions.

Perhaps the most important element of an ARFF training facility is the type of fuel used to create the live fires. Presently, there are two fundamental alternatives: conventional fuels and propane. These two technologies are discussed further in this section, but for ease of comparison, Table 10.5 provides a matrix of "pros and cons" commonly associated with each fuel type.

10.5.2 Technology Overview

This section provides an overview of three types of technology used for ARFF training facilities: traditional, British design, and propane systems.

TABLE 10.4

PROJECT PROGRAMMING LIST FOR ARFF TRAINING FACILITY

Component	Fossil Fuel	Propane	Purpose
Burn Area			
Floor	Reinforced, portland cement concrete or high density flexible membrane liners (i.e., HDPE); penetrations for support equipment	Same as fossil fuel	Containment and collection of water/fuel; support for mockup
Curbs (interiors and perimeters)	Refractory concrete	Concrete masonry block or portland cement concrete	Permit specific zonal training and containment of water/fuel
Interior crushed stones	Angular, well graded, nonfriable materials	Same as fossil fuel	Walking surface, heat absorbent counteract drifting water/fuel
Berm	Nonfriable, erosion resistant material	Same as fossil fuel	Gentle slope for entering/exiting burn area
Zonal Fuel/Water Delivery Network	Inground piping with pumps, risers, branch pipes and nozzels in accordance with API and NFPA codes	Provided by contractor; same as fossil fuel with gauges and burners	Delivery of fuel/water to burn area
Drainage System	Iron or fiberglass inground piping.	Same as fossil fuel	Removal of unburned fuel and water
Ignition/Flame Generation System	Sparker flame generating equipment	Provided by contractor, same as fossil fuel with burners	Ignition of fuel and/or propagation of flame
Sensors	Not required	Provided by contractor	Monitoring of water application
Vehicle Maneuvering Area			
Apron	Portland cement concrete, crushed stone or gravel	Same as fossil fuel	ARFF vehicle maneuvering surface, collection of spills, stormwater, etc.
Mock-Up(s)			
Aircraft	General shape of fuselage, able to withstand high radiant energies, direct flame and repeated thermal cycling stresses	Same as fossil fuel	Target for practicing ARFF operations
Aircraft Components	Wing, engine, landing gear, etc. (not including interior fire); may be part of aircraft mock-up or separate simulator(s)	Same as fossil fuel and may include interior mock-ups (i.e., cockpit, galley, etc.)	Same as aircraft mock-up

TABLE 10.4

PROJECT PROGRAMMING LIST FOR ARFF TRAINING FACILITY
(continued)

Component	Fossil Fuel	Propane	Purpose
Control Center			
Protective Wall	Concrete block	Not required	Protection from heat and flames for trainers and support equipment
Control Building (or Compound)	Valves, switches and other mechanical/electrical equipment	Central control console with computer, monitors and software provided by contractor	Control of fuel/water supply systems, drainage, and ignition
Fuel/Water Storage System			
Fuel	Fiberglass or steel below ground or above ground tank that meets ADEQ criteria	Aboveground tank(s) for liquid propane that meets NFPA codes	Storage of fossil fuel or propane
Water	Same as fuel (or storage pond)	Same as fossil fuel	Storage of recycled and make-up water; water source for ARFF vehicles and equipment
Wastewater Treatment System			
	Catch basin, oil/water separator filters (carbon/sand), retention/evaporation pond and/or wastewater treatment plant	Retention/evaporation pond	Recovery of fossil fuel and/or treatment of wastewater
Other Components			
Access Road	Concrete, asphalt or crushed rock	Same as fossil fuel	Access/egress for trainers, students, delivery and ARFF vehicles
Parking Lot	Same as access road.	Same as access road	Parking for above
Support Buildings	Office, classrooms, restrooms, vehicle/equipment storage	Same as fossil fuel	Space for administrative, instruction, maintenance and storage requirements
Security Fence	Chain link and/or stockade	Same as fossil fuel	Protection against unauthorized access
Water Well	Capable of refilling water storage tank or pond	Same as fossil fuel	For burn area make-up water
Smoke Suppression System	Water spray or smokeless fuels	Water spray or not required	Provides knock-down of smoke particles and cools equipment.

TABLE 10.4

PROJECT PROGRAMMING LIST FOR ARFF TRAINING FACILITY
(continued)

Component	Fossil Fuel	Propane	Purpose
ARFF Vehicles	Equipped with turret and hand line application equipment; water and foam storage	Same as fossil fuel (foam storage unnecessary)	Training vehicles for students
Environmental Monitoring	Groundwater monitor wells or other leak detection method	Not required	Early detection of spills or leaks
Water Supply	On-site well or public utility	Same as fossil fuel	Filling and washing out of burn area, smoke suppression system
Sanitary Sewer	On-site facility or public utility	Same as fossil fuel	Off-site disposal of waste water
Electrical Service	Public utility	Same as fossil fuel	Electricity for pumps, lighting, control systems, support buildings

(Page 3 of 3)

Information developed by Greiner, Inc., 1995 from FAA AC 150/5220-17A, "Design Standards for an Aircraft Rescue and Fire Fighting Training Facility".

TABLE 10.5

COMPARISON OF ARFF TRAINING SYSTEMS MATRIX[a]

Criteria	Fossil Fuel	Propane
FAA Requirements	+ Meets Part 139 requirements	+ Meets Part 139 requirements
ADOT Requirements	+ Meets requirements	+ Meets requirements
Technology History	+ Standard technology prior to 1992	- New technology since 1992
Training Value	+ Very realistic for heat, flames, smoke, extinguishing requirements - Turnaround time between fires governed by refueling rate, problems with reignition and water level adjustments. - Specific fire size, location and duation difficult to control + Water and/or water/foam mixture used as extinguishing agents + Teaches realism - Interior space training very limited	- Realism simulated with burners, sensors and automated/manual controls; unrealistic smoke levels. + Minimal time between fires + Size, location and duration of fire controlled by computer or manually - Foam usually not used; surregate foams available + Teaches techniques + Interior space training conducted
Maintenance and Repairs	- Burn area concrete cracking/spalling and igniter malfunctions common problems - Requires upkeep	- Complex system of burners, igniters, sensors and valves controlled by computer requires specialized service - Requires upkeep
Operation	- Requires experienced operator	- Requires trained operator
Safety	- Fire must be extinguished with water or foam	+ Fire controlled by computer, trainer and/or emergency shut off.
Environmental Air Quality	- Dense, black smoke highly visible for long distance and duration - Other air pollutants emitted in moderate quantities + Unlikely to cause violation of AAQS + SIP conformity determination likely not required	+ Smoke visible, but not for long distance or duration + Other air pollutants emitted in smaller quantities + Very unlikely to cause violation of AAQS + SIP conformity determination not required

TABLE 10.5

COMPARISON OF ARFF TRAINING SYSTEMS MATRIX[a] (Continued)

Criteria	Fossil Fuel	Propane
Soil/Surface Water and Groundwater	- History of causing contamination from spills and/or leaks	+ Not expected to cause contamination
Wastewater	- Requires treatment with catch basin, oil/water separator filters and/or waste water treatment plant	+ Non foam or fuel containing water requires no treatment
Permits	- NPDES for off-site disposal of wastewater (w/o public sanitary sewer); and construction	- NPDES for disposal of wastewater (w/o sanitary sewer); and construction
	- Open burn permit (minimal)	- Open burn permit
	- Aquifer Protection Permit	- Aquifer Protection Permit
Other Potential Limitations	- Dense, black smoke may be objectionable in some areas and less acceptable to regulatory agencies	- Construction costs significantly more than fossil fuel facilities.
Construction Costs	$1.2 - 2.0 million	$6.0 - $15.0 Million

[a] Information compiled by Greiner, Inc., 1995.
+ Denotes "pro".
- Denotes "con".

10.5.2.1 Traditional Fossil Fuel Facilities

Historically, most ARFF training facilities were designed and constructed to use fossil fuels such as kerosene, JP-4, and jet fuel. The traditional concept used in the United States involves floating a layer of fuel on top of the crushed stone and water within the burn area. The fuel is then ignited, allowed to burn, and finally extinguished with water, or a mixture of water and foam.

A variety of live-fire sizes and scenarios are created by introducing the fuel into different zones of the burn area. "Pool" or "spill" fires are common and, in most cases, the mock-ups consist of a simulated aircraft fuselage and wing, although engine and landing gear mock-ups have been successfully constructed.

The primary advantage of these fossil fuel ARFF training facilities is the "realism" they provide in terms of the flames, heat and smoke commonly associated with aircraft fires. Additional realism is experienced because the fire can only be extinguished by the fire fighters themselves. Another major advantage of the fossil fuel facility is the "time-tested" and proven technology obtained from the design, construction and operation of numerous facilities across the country.

In contrast, some of the attributes that make traditional fossil fuel ARFF training facilities popular also create some significant problems. For example, because the uncontrolled burning of these fuels produces a dense, black smoke, the plume is highly visible for many miles. These air pollutants are of great concern in some areas for environmental reasons and are considered a visual nuisance by many. The fuel, the foam and the wastewater are potential soil, surface water and groundwater contaminants, should the environmental safeguards designed into the facility fail or if a spill occurs. Soil and groundwater clean-up has become an expensive problem with several existing fossil fuel facilities.

Other disadvantages associated with fossil fuel training facilities include several operational issues. Because liquid fuel is used, the size, location and duration of the live fire in the burn area is difficult to control by inexperienced operators. In other cases, the burning fuel is unintentionally pushed out

of the burn area creating a potential hazard or environmental problem. In addition, because fuel must be added to the burn area for each new live fire and water level adjustments are sometimes required, the number of live fires is time-limited.

10.5.2.2 British Design

A variation on the traditional, conventional-fuel, ARFF training facility has been developed and is used widely throughout the United Kingdom. One system, produced by Imperial Fire Devices, Inc., includes full scale mock-ups of aircraft components (i.e., wheel/brake unit, wings, wing and tail engines, cockpit, galley, lavatory, cargo hold and auxiliary power units) and the necessary ancillary operational/control equipment (i.e., pipes, valves, pumps, tanks, etc.)

Using this concept and equipment, the fuel (JP-4, jet fuel or kerosene) is aerosolized, or sprayed, as a mist onto the mock-up's metal surfaces through a series of pipes and small nozzles. The fuel is ignited and extinguished by the fire fighters using water or a water/foam mixture. The facility operator controls the fuel feed rate, increasing or decreasing the fire intensity or shutting it down completely. Small pool fires can be created by allowing fuel to "puddle" beneath, and around, the mock-ups before ignition. For the purposes of this study, the British design also includes the necessary equipment to create large "conventional" pool fires.

Advantages over traditional facilities include (1) the more efficient combustion of fuel, (2) decreased fuel usage, (3) reductions in smoke and wastewater, (4) increased control and repeatability of live fires, (5) improved safety and (6) lower construction costs.

Approximately 15 such ARFF training facilities have been built in the United Kingdom and several were visited by Greiner, Inc. personnel (see Appendix K for additional information). Unfortunately, none have been built, or are currently in use, within the United States at this time.

10.5.2.3 Propane Systems

According to materials developed by Contraves Inc. and Symtron Systems Inc., two leaders in propane fire training systems, this ARFF training technology offers the following advantages:

- Minimal smoke and wastewater generation.
- Totally controllable and repeatable training exercises.
- Flexibility in specifying and modifying training objectives.
- Built-in safety measures that do not exist with fossil fuel systems.
- The choice of water, foams or substitute foams.

Training fires that can be simulated using propane trainers include:

- Aircraft fuel spill fires (with "flame up" and "reflash").
- Wing and tail engine fires.
- Wheel/brake landing gear fires.
- Cockpit, passenger cabin, galley, baggage, and cargo compartment fires.
- Auxiliary Power Unit fires.
- Three dimensional fuel leak fires.
- Pool or fuel spill fires.

The basic concept associated with each of these fires involves the supply of liquid propane to gas burners located in the floor of the burn area and within the mock-ups. In the automated, or "computerized", trainers, sensors monitor the application of extinguishing agents to the live fire, adjust the flow of propane, and thereby the size of the fire. If the application of agents ceases before the flames are "extinguished", the automated control system can simulate regrowth of the fire.

It is important to note that with propane-fueled facilities, the fire is not extinguished by the application of the agent, but by the reduction in the flow of propane to the burners. In the manual versions under consideration by the U. S. Air Force, this is accomplished by human operators using valves and switches to reduce the flow of propane to the burners.

Because of the comparatively clean-burning properties of propane fuel, the smoke is much less dense and black than the smoke from traditional fossil fuel ARFF training facilities. Furthermore, liquid

propane does not require all the environmental safeguards to protect against soil, surface water and groundwater contamination compared to fossil fuel.

Another advantage of the propane-fueled facility is the ability to control the location, size and time period of the fire. This reportedly adds some degree of safety in the event a fire fighter is injured or unable to exit the burn area. It also becomes highly unlikely that the burning fuel will escape the confines of the burn area.

A variation on the propane-fueled facility has also been developed for portability. These units, developed by R^2 and Symtron Systems, are trailer-mounted and can be transported to any training site. However, because FAA only permits the certification of Part 139 Index A and B airport fire fighters with these units, they were not considered suitable to meet the training needs of the State of Arizona.

10.5.3 Other Technologies

Other types of fire fighting technologies that may have application to a regional ARFF training facility are identified and briefly summarized below:

- **Fire Fighting Equipment** - Manufactured by Oshkosh Truck Corp. and others, these specially designed vehicles carry between 1,000 and 3,000 gallons of water and 130 to 420 gallons of foam. These trucks weigh between 33,000 and 67,000 pounds when loaded and are equipped with both handline and turret application equipment.

- **Multimedia Interactive Training** - Using video, audio, graphics animation and computer workstations, students are instructed in ARFF techniques including aircraft approach, engine shut down, crew and passenger extraction, and fire extinguishing procedures. Utilized experimentally by the U.S. Air Force, this is a proposed application of computer-based training in the civilian area. BDM - Federal of Huntsville, Alabama is the developer of this system.

- **Smokeless Fuels** - Developed by Exxon, Envirofire, and Dion & Sons, these highly refined and specially blended hydrocarbon fuels and chemicals reportedly produce little or no smoke when burned. Intended to address the air pollution

concerns associated with ARFF training facilities, these fuels have limited application, thus far.

- **Aqueous Film Forming Foam (AFFF)** - Used as a fire extinguishing agent, this synthetic surfactant is mixed with water in a 3 to 6 percent solution which forms a vapor suppressing seal over the fire. Biodegradable and low in toxicity, disposal in a wastewater treatment plan is recommended. Also available as a fluroprotein foam and training foam. These products are distributed by Chemguard, Inc., 3M, and others.

10.6 PRELIMINARY LAYOUT AND SCHEMATIC DESIGN

This task involved the preliminary layout and schematic design of an ARFF training facility. These layouts and schematics are intended to graphically illustrate the primary facility components (i.e., training areas, support systems, buildings, etc.). These plans were also used in support of the preliminary cost estimates prepared for this project.

10.6.1 Layout Methodology

In accordance with the Scope of Work for this study, six "generic" site layouts were originally developed in the form of architectural "schematic" programming sheets during Task 6. The function, size, and/or capacities of the individual components and their overall dimensions were comparable between the alternatives and were considered "ultimate" facilities that would likely be scaled back. The primary differences among each layout was in the positioning of the facility components and the overall shape of the site. However, in all six cases, required separation distances, functional relationships, and efficiencies of use of the equipment were equally considered when laying out the sites.

Because the general layouts of ARFF training facilities using either conventional fuels or propane do not differ substantially, the schematics for this task were developed to potentially accommodate both types of training technologies. The specific design and engineering requirements for conventional or propane-fueled facilities can be addressed later during the preparation of final engineering/architectural design drawings.

10.6.2 Preliminary Schematic Design Drawings

The original six schematic layouts are contained in the *Second Draft Report* and identified as Plans 1 through 6. These plans were reviewed by the ARFF Study Committee and displayed at the ADOT Public Information Meeting held at Williams Gateway Airport in April 1995. Verbal comments from ADOT, the Committee, fire fighters and potential host sites were generally favorable.

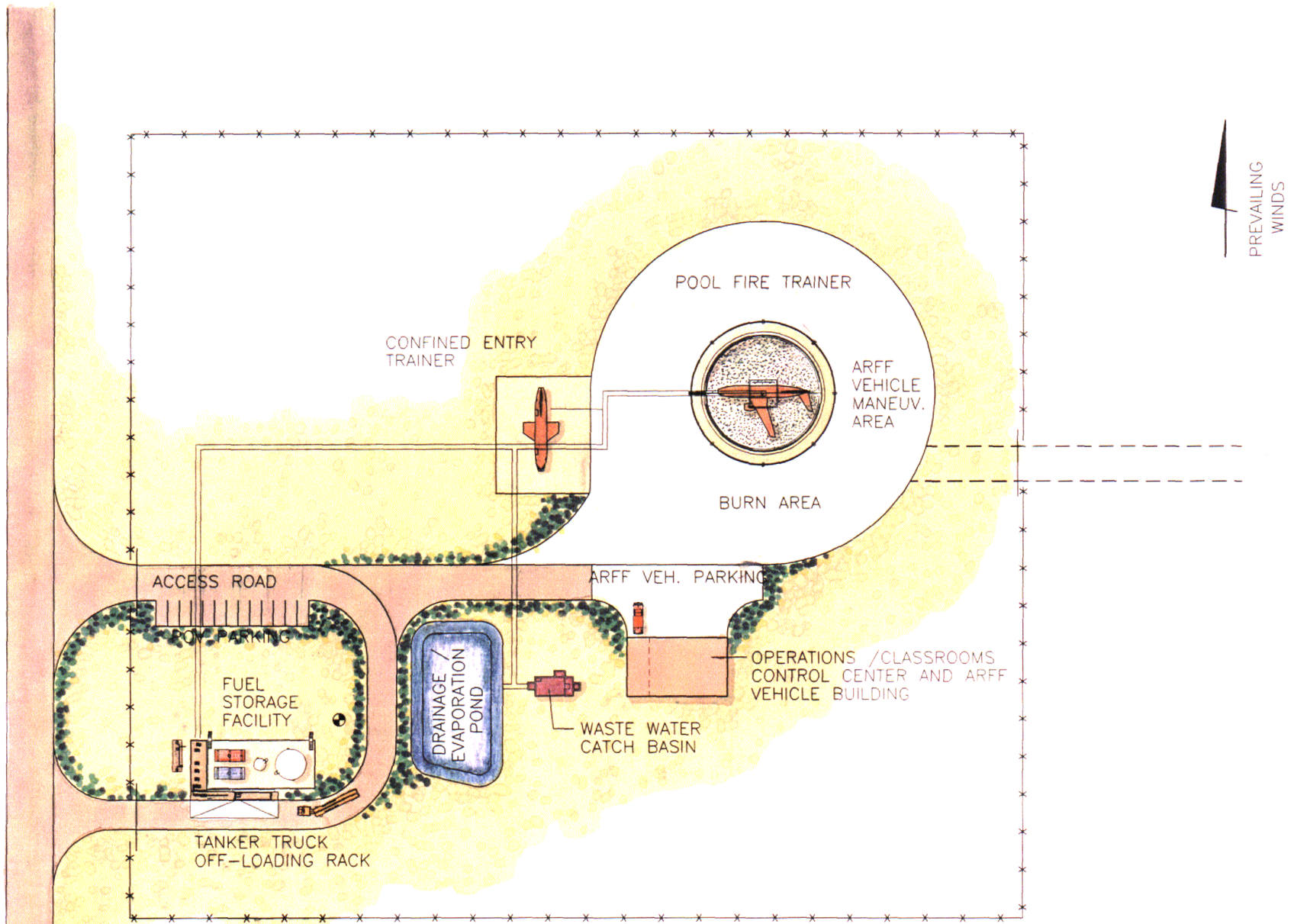
During Task 7 - Preliminary Cost Estimates, the estimated construction costs for the original six schematic layouts ranged from $7.4 to $12.9 million. Taking into account possible site-specific cost savings, the adjusted construction costs ranged between $3.5 and $10 million, depending on the site, technology and layout. In contrast, during Task 9.0 - Financial Feasibility, it was determined that building any of these facilities would not be cost effective at any of the potential host sites (assuming a low end estimate of potential users).

As a result, the ARFF Study Committee recommended that the original schematic layouts be scaled back to help reduce the estimated construction costs. Schematic Layout Plan No. 1SB that follows represents this scaled back version. The site is approximately 800 feet by 900 feet (16.5 acres) and includes a circular burn area; aircraft mock-up; a combined operations/control center and ARFF vehicle building; confined entry (smoke) trainer; wastewater treatment system, fuel storage facility, access/egress roads and security fence.

Several attributes of this revised layout include the following:

- Adaptable to both conventional fuel and propane.
- Future expansion areas in two quadrants of the site.
- Space for other specialized mock-ups around the burn area.
- Represents best conservation of utilities, pavement, etc.
- Easily adaptable to sites with existing support facilities.
- Meets or exceeds FAA design guidelines.

The construction and O/M costs for this layout are discussed in Section 10.7 of this report.



LEGEND

ARFF	AIRCRAFT RESCUE AND FIRE FIGHTING
BLDG.	BUILDING
	CONFINED ENTRY FIRE TRAINER
	POOL FIRE TRAINER
POV	PRIVATE OWNED VECHILE
	T1000 OSHKOSH ARFF VECHILE
	TANKER TRUCK OVER THE ROAD
MAINT.	MAINTENANCE
MANEUV.	MANEUVER
VEH.	VEHICLE
	WELL (MAKE UP WATER)

100 0 100 200 300

ADOT AERONAUTICAL DIVISION
ARFF TRAINING FACILITY

FEASIBILITY STUDY AND ENVIRONMENTAL REVIEW

SCHEMATIC LAYOUT PLAN NO.1SB

It is important to note that the final layout and design of the ARFF training facility could differ somewhat from the schematic depending on (1) the selected site, (2) the available funds, (3) the preferred technology, and (4) the availability of existing facilities and components.

10.7 PROJECT CONSTRUCTION AND O/M COST ESTIMATES

For the purposes of this task, cost estimates were subdivided into two general categories: (1) project (i.e., construction) costs and (2) operation/maintenance (O/M) costs. To the extent possible, these costs were based on information obtained in connection with other existing, and planned, ARFF training facilities across the United States and around the world. Supplemented with data from industry-standard price books and adjusted, as necessary, for this particular project and the Arizona location, this information is also used in connection with the financial feasibility analysis presented in the next section.

10.7.1 Revised Project Construction Costs

During Task 7 (Preliminary Cost Estimates), project construction and O/M costs were developed for both conventional fuel and propane ARFF training facilities. These preliminary cost estimates, contained in the *Second Draft Report*, were based on "ultimate" facilities that were expected to be scaled back based on the outcome of Task 9 (Financial Feasibility).

As stated previously, the initial project construction costs ranged from $7.4 to $12.9 million, depending on the technology and site layout. After applying site-specific cost savings for existing or planned support facilities, the adjusted construction costs were reduced to between $3.5 and $10 million. By comparison, assuming the low end estimate of potential users from within Arizona, the Financial Feasibility Analysis determined that these construction costs were not justifiable.

Therefore, revised project costs have been prepared for scaled back facilities using both conventional and propane fuels. These scaled back facilities are intended to satisfy FAA and NFPA requirements and contain all the necessary components of a successful ARFF training facility. A schematic layout (Plan No. 1SB) has been prepared of the scaled back facilities and was described in Section 10.6.

The revised Estimated Costs Worksheets for the scaled back facilities are contained in Appendix L. The costs are broken out by technology type (i.e., fossil fuel (traditional design or the British concept) and propane), and primary component (i.e., burn area, mock-ups, fuel/water storage system etc.) The category "Other Components" includes a wide variety of construction items including site work, access road, support buildings, utilities and other appurtenances. Other construction costs including an ARFF vehicle; design fees; construction, engineering and inspection (CE&I) fees; permitting and impact fees; and a 15 percent contingency fee for unforeseen costs are also added.

For ease in assimilating this information, Table 10.6 contains a summary of these estimated project construction costs. The two fossil fuel alternatives (i.e., the traditional design and the British concept) and the propane-fueled ARFF training facility are shown separately. As shown, the traditional fossil fuel facility is expected to cost $2,615,000. By comparison, the fossil fuel facility designed around the British concept is expected to cost $2,730,000. Finally, the propane-fueled training facility is estimated to cost $6,575,000.

During the site evaluation and selection process, existing or planned equipment, personnel, buildings, etc. that would help support this project were considered. Table10.7 provides a summary of site-specific costs savings for the City of Phoenix Emergency Services Institute ($200,000), Tucson Public Safety Academy ($569,000), and Williams Gateway Airport ($211,000) sites taking into account these factors. As shown in Table 10.8, these construction costs savings are applied to the Total Construction Costs to obtain the Adjusted Construction Costs for each technology type and site. For brevity, construction costs for the five lower ranked sites are not included.

TABLE 10.6

MATRIX OF PROJECT CONSTRUCTION COST ESTIMATES FOR FOSSIL FUEL AND PROPANE SYSTEMS

Component	Alternative Technologies		
	Fossil Fuel		
	Traditional Design	British Concept	Propane
Burn Area	$164,906	$143,724	$130,506
Vehicle Maneuvering Area	$119,950	$124,533	$119,950
Mock-Ups	$300,000	$395,250	$3,000,000
Operations Building	$228,000	$228,000	$700,000
Fuel/Water Storage System	$222,061	$211,118	$82,650
Wastewater Treatment System	$41,022	$41,022	$21,022
Other Components	$534,458	$534,458	$452,058
Total	$1,610,397	$1,678,105	$4,506,186

Notes:

1. Total costs do not include fire fighting equipment; permitting, impact, design, and CERI fees; and 15% contingency.
2. See Appendix L for Cost Estimate worksheets.
3. Costs are "order of magnitude" estimates for planning purposes only and should not be used for budgeting purposes.
4. Final project costs could differ based on selected site, available funds, and availability of other supporting facilities or equipment.
5. Other components include sitework, access road, parking lot, support buildings (classroom, office, equipment/vehicle storage), utilities and a wide assortment of other appurtenances.
6. British concept includes pool fire capability.

TABLE 10.7

MATRIX OF POSSIBLE COST SAVINGS BY ALTERNATIVE SITE

Possible Cost Savers	Tuscon Public Safety Academy	Williams Gateway Airport	City of Phoenix Fire Dept. Emergency Services Institute
Support Buildings	$200,000	$200,000	$200,000
Wastewater Treatment	$41,000	$11,000	----
Fuel/Water Storage	$20,000	----	----
Other Components	$308,000	----	----
TOTAL	$569,000	$211,000	$200,000

Notes:

1. Support buildings include offices, classrooms and equipment/vehicle storage facilities.
2. Other components include, sitework, access road, parking lot, utilities and a wide variety of other appurtenances.
3. Costs are "order of magnitude" estimates for planning purposes and should not be used for budgeting purposes.
4. For brevity, only the three highest ranked sites are addressed in this table.

10.7.2 Revised Operation/Maintenance Costs

Estimated O/M costs for utilities, staff, supplies and routine maintenance are difficult to derive. This is because most existing regional ARFF training facilities have been operational for less than two years, many are under warranty, and individual facility utilization schedules differ substantially.

As initially demonstrated during Task 7 (Preliminary Cost Estimates), O/M costs for an "ultimate" facility were estimated to be $180,000 annually. These costs include full-time instructors, administrative staff, utilities, etc., and appear to be reasonable compared to some existing regional training facilities with high use (i.e., Dallas/Fort Worth, Texas; Duluth, Minnesota; Fayetteville, North Carolina).

This initial O/M cost estimate was scaled back to a range of $55,000 to $75,000 annually to reflect the likely "baseline" demand on an ARFF training facility in Arizona. These costs could vary substantially between conventional and propane-fueled facilities, but this difference has remained undocumented in this report.

10.8 POTENTIAL LIABILITIES

This task identified and discussed potential risks and liabilities for the owner, operator, and/or user of an ARFF training facility located in Arizona. Wherever possible, and to the extent they are known, mitigation or risk-reduction measures were also discussed.

The liabilities and risks associated with the construction and operation of an ARFF training facility were subdivided into the following four subcategories: technology, economic, safety, and environmental. Unfortunately, the ability to accurately predict and, thereby avoid, or minimize, potential problems is somewhat limited due to the relative absence of this information in connection with other fire training facilities. However, the following fundamentals, originally discussed in the *Second Draft Report*, should be used as a framework in support of decisions affecting this project.

10.8.1 Technology

Live-fire training, using either conventional fuel or propane, involves equipment and materials that are repeatedly subjected to smoke, flames, extreme heat, water, fuel, AFFF, and the natural elements (i.e., wind, U.V. radiation, precipitation, etc.). Under normal operating conditions, it is expected that they will wear out, deteriorate, or otherwise fail over time.

In order to help reduce the liabilities and risks associated with the technological limitations of the available training systems, the following mitigation measures should be adopted:

- Incorporate fire training facility design, materials, and functions that are proven to be successful at other existing facilities.
- Utilize the training facility systems and components in accordance with their intended design, function, and capacities.
- Provide only the type of training the firefighters are required, or have shown a desire, to have.
- Locate, operate, and maintain the training facility in a manner that will help preserve its structural, mechanical, and operational integrity and functions.
- Design and construct the facility following accepted architectural/engineering practices provided by experienced contractors.
- Avoid obsolescence, to the extent possible, with up-to-date training equipment and requirements, aircraft mock-ups and simulators and other system components.

Notably, most of the ARFF training facilities using fossil fuel employ materials, equipment, and methods that have been tested over time and under a wide variety of conditions. As a result, the technological limitations of these facilities is better known. Propane-fueled facilities are relatively new and the components (including labor) are covered under a warranty by the manufacturer. Therefore, the type and extent of the technological limitations associated with these facilities is less well known.

10.8.2 Economic

As previously discussed, the majority of the regional ARFF training facility construction costs are eligible for FAA funding through the Airport Improvement Program (AIP). In contrast, O/M costs are usually borne by the facility owner/operator. As a result, the unfunded construction and O/M costs are offset with user fees, to the extent possible.

In order to help reduce the liabilities and risks associated with the costs for constructing, operating, and maintaining an ARFF training facility in Arizona, the following mitigation measures should be considered:

- Review the Economic Feasibility Study for this project (Task 9) that compared the estimated costs for building and operating a training facility against the anticipated revenues collected from the users.
- Realistically anticipate the revenue-generating capability of a regional ARFF fire-training facility.
- Offer the facility and training to other fire fighters.
- Locate the ARFF training facility in an area where the use will not be significantly restricted.
- Participate in "mutual aid" with other entities requiring aircraft live fire training.
- Incorporate the use of the ARFF training facility with other related public safety training.
- Select a host site that has demonstrated its willingness and commitment to help fund, construct, operate, and maintain an ARFF training facility.
- Build only those elements of the training facility that are either required or will otherwise be utilized by firefighters.
- Develop a standard set of user fees and require users to sign and/or provide documents insuring payment for services, equipment, and materials provided.

Again, the concepts of regional ARFF training facilities and the offering of such training to airport firefighters for compensation are relatively new. For example, the first FAA-funded regional training facilities have been in operation for less than two years. As a result, the economic risks and liabilities of constructing and operating a facility in Arizona are difficult to predict, based on experiences in other states.

10.8.3 Safety

ARFF training facilities, by their intended design and function, involve flammable liquids and gases, smoke and other products of combustion, heat and flames, confined spaces, and other potential health and safety risks to the users. This is because the objective of the training is to provide realistic conditions that enable firefighters to deal with the special problems associated with aircraft rescue and fire-fighting. In order to help reduce the inherent safety liabilities and risks associated with the operation of an ARFF training facility, the following mitigation measures should be considered:

- Require facility operators and trainers to be experienced and qualified to conduct live fire and confined space training.
- Require facility users to be properly trained in firefighting techniques, be physically fit, and meet all other requirements of firefighters.
- Provide users with safety lectures and/or lessons explaining the potential hazards of the training.
- Require users to utilize their own personal protective equipment, suits, breathing masks, etc.
- Require trainers and users to perform only standard ARFF drills.
- Limit the simulation, or practice, of confined space entry and smoke training to a minimum.
- Label and sign all known hazards in and around the facility in accordance with OSHA guidelines.
- Require users and trainers to sign agreement documents indicating proof of insurance, waiver of claims, and any other special conditions.

- Have the facility design plans and specifications, as well as the constructed facility, reviewed by a qualified safety professional.

While the liability of offering live fire training to firefighters can never be eliminated, reasonable precautions taken by the owner, operator, and users of the facility can help minimize the risks. As a general policy, these risks must also be balanced with the risks to the air traveling public when aircraft firefighters are not properly trained to respond to an emergency.

10.8.4 Environmental

As previously discussed, ARFF training facilities, by their intended design and function, involve varying amounts of flammable fuels, smoke, and waste materials. In order to help reduce the liabilities and risks associated with the potential environmental impacts of an ARFF training facility, the following mitigation measures should be considered:

- Select training technologies that minimize environmental impacts.
- Incorporate environmental protection measures into the design of the facility.
- Develop and practice pollution prevention measures in the design, and during the operation, of the training facility.
- Obtain all necessary environmental permits.
- Educate the facility operator and users in the methods and importance of environmental protection.
- Utilize the facility components and environmental safeguard equipment for their intended purpose.
- Locate the facility outside environmentally protected or sensitive areas.

The most common complaints from the general public and regulatory agencies in connection with ARFF training facilities are associated with environmental issues; smoke, soil/groundwater contamination, and wastewater disposal being the three primary sources of concern.

10.9 FINANCIAL FEASIBILITY

This task involved conducting financial feasibility analyses for an ARFF training facility in Arizona. Construction, operation and maintenance (O/M) costs as well as potential cost recovery sources were considered. The primary purposes of these analyses were to help determine an affordable cost for a training facility and evaluate the extent fees collected from the users of the facility would likely offset the initial construction and annual O/M costs.

The results of this analysis are primarily intended for planning purposes and do not necessarily represent "bottom line" values used to make final financial decisions in connection with this project. Rather, this information is more suited for identifying, and generally quantifying, the best sources of financial support in comparison to the anticipated costs to build and operate an ARFF training facility.

10.9.1 Methodology

The methodology used to test financial feasibility in this study is the conventional benefit/cost (B/C) analysis. Following this methodology, the present (current year) value of the anticipated annual revenues from user fees (i.e., benefits to the ARFF training facility host) is compared against the present value of the owner's portion of the construction costs and the annual O/M costs of the facility in a discounted cash flow analysis. Essentially, if the ratio of benefits-to-costs (the B/C ratio) is greater than 1.0, the project is considered cost-effective or financially feasible.

It has already been established that the number of fire fighters which can be expected to use the facility range from a low of 177 to a high of as many as 1,890. The low estimate is the present number of Arizona fire fighters at the 11 Part 139 certificated airports who are required by FAA to receive the "live fire" training.

In the B/C calculation, the low end of the estimate (177 fire fighters in the opening year, increasing to 250 in future years) was used for conservatism. This is also consistent with the FAA-intended

primary purpose of the facility which is to provide training to fire fighters at Part 139 certificated airports. The high estimate includes Arizona-based general aviation fire fighters and non-airport fire fighters who responded to the surveys. It is anticipated that some portion of the general aviation fire fighters and non-airport fire fighters would use the ARFF training facility if it were constructed and in operation.

User fees were determined through an assessment of similar ARFF training facilities which are presently in operation within the United States. From this comparison, the tuition revenue which would be earned at an ARFF training facility in Arizona is estimated at $375/trainee/day. The resulting conservatively low estimate of the annual gross revenues which could be earned by the ARFF training facility is $66,375 (177 trainees x $375/trainee) in the opening year, increasing to $91,250 (250 trainees x $375/trainee) after five years.

The capital expense (design and construction costs) necessary to put the facility and equipment in place differs depending on the selected technology and alternative site for the ARFF training facility. As previously reported, the estimated construction costs for the traditional and British fossil fuel facilities (with pool fire capabilities) are $2,615,000 and $2,730,000, respectively, and $6,575,000 for propane facilities.

Potential "site-specific" cost adjustments taking into account existing or planned equipment, personnel, buildings, etc., that would help support, or complement, this project were also considered. These site-specific cost savings for the City of Phoenix ESI ($200,000), Tucson Public Safety Training Academy ($569,000), and Williams Gateway Airport ($211,000) were summarized in Table 10.7. By applying these site-specific cost adjustments to the estimated construction cost estimates, the total capital investment costs for each of these three sites were computed. These values are also shown in Table10.8.

Notably, the user costs for travel, lodging, salary, etc., were not addressed in the B/C analysis. Rather, the "benefit" is measured in terms of the ability of the host site to recover its costs.

TABLE 10.8

MATRIX OF TOTAL, ADJUSTED AND OWNER CONSTRUCTION COST ESTIMATES BY ALTERNATIVE TECHNOLOGY AND SITE

	Tucson Public Safety Academy			Williams Gateway Airport			City of Phoenix Fire Department Emergency Services Institute		
	Fossil Fuel			Fossil Fuel			Fossil Fuel		
Alternative Technology	**Traditional**	**British**	**Propane**	**Traditional**	**British**	**Propane**	**Traditional**	**British**	**Propane**
Total Construction Costs	$2,615,000	$2,730,000	$6,575,000	$2,615,000	$2,730,000	$6,575,000	$3,915,000	$4,030,000	$7,875,000
Site Cost Saving	$569,000			$211,000			$200,000		
Adjusted Costs	$2,046,000	$2,161,000	$6,006,000	$2,404,000	$2,519,000	$6,364,000	$3,715,000	$3,830,000	$7,675,000
Owner Costs	$205,000	$216,000	$601,000	$240,000	$252,000	$636,000	$372,000	$383,000	$768,000

Notes:

1 Site Cost Savings from facilities, equipment, etc. located at, or planned for, the individual sites.
2 Adjusted Costs = Total Estimated Construction Costs - Site Cost Savings.
3 Owner Costs = Adjusted Costs x 10% (remaining 90% assumed to be funded from FAA Airport Improvement Program).
4 Owner costs do not include potential "matching funds" from ADOT.
5 Costs are "order of magnitude" estimates for planning purposes and should not be used for budgeting purposes.
6 City of Phoenix Fire Department ESI site includes land acquisition costs.
7 British fossil fuel system includes pool fire capability.
8 Only the three highest ranked sites are addressed in this table.

As previously stated, certain costs will be incurred over the 20-year analysis period for operating and maintaining the ARFF training facility. These O/M costs include routine and periodic maintenance of the facility, equipment, buildings and grounds; labor costs; etc., and are estimated to range between $55,000 and $75,000 annually.

In addition to the routine O/M costs, it is anticipated that certain costs must be incurred for periodic maintenance items associated with the ARFF facility. For example, the support buildings (if constructed) will require periodic maintenance and repair for continued serviceability. Insufficient documentation is available from in-place ARFF facilities to allow estimating periodic maintenance costs for aircraft mock-up components, although it is certain, in principle, that they would also occur. Examples of such requirements might be replacement of crushed stone and curbing at the fire pits, replacement or repair of flame generating system parts, and replacement of some mock-up components which are continually exposed to fire conditions. Because of this lack of data, this analysis has made no assumptions in this regard and the results should be understood in this light.

Finally, in the case of the City of Phoenix Fire Department Emergency Services Institute site, land acquisition costs were also considered. Based on the assumption that a 15-acre parcel is acquired at $85,000/acre ($2.00/sq. ft.), the estimated land purchase price is $1,300,000. The owner's share of $130,000 (10%) is included in the B/C analysis.

10.9.2 Revised Results

The results of the B/C analysis are summarized in Table 10.9. As stated previously, a B/C ratio of 1.0 or greater is used as an approximate measure of acceptability.

The Tucson Public Safety Academy site has B/C ratios of 0.99 and 0.98, respectively, for the traditional and British fossil fuel facilities. Given the range of uncertainties inherent to the analysis, these results are considered to be a positive sign of economic feasibility. The propane-fueled facility has a B/C ratio of 0.73 at this location.

TABLE 10.9

B/C RATIO SUMMARY BY ALTERNATIVE TECHNOLOGY AND SITE

	B/C Ratio[1]		
	Fossil Fuel		
Site	Traditional	British	Propane
Tucson Public Safety Academy	0.99	0.98	0.73
Williams Gateway Airport	0.96	0.95	0.71
City of Phoenix Emergency Services Institute	0.86	0.85	0.65

1 If B/C Ratio ≥1.0, considered to be cost effective.
2 Results do not include the benefit of ADOT matching funds.
3 Only the three highest ranked sites are addressed in this table.

Williams Gateway Airport has B/C ratios of 0.96 and 0.95, respectively, for the traditional and British fossil fuel facilities. Again, these results are considered to be acceptable. The propane-fueled facility has a B/C ratio of 0.71 at this location.

The City of Phoenix Fire Department Emergency Service Institute has B/C ratios of 0.86 and 0.85 for the traditional and British fossil fuel facilities. These figures reflect the land acquisition costs required for this site. The propane-fueled facility has a B/C ratio of 0.65 at this location.

The B/C analysis computation sheets are contained in Appendix N of this report. Notably, the B/C analysis did not include the benefit of ADOT matching funds, which could amount to approximately 5 percent of construction costs.

10.10 RECOMMENDATIONS

This final task involves the development and reporting of the recommendations of the ARFF Study Committee and the Consultant in connection with this project. For the most part, these recommendations were based on the facts and findings contained in this, and the three previous, reports.

10.10.1 Committee Recommendations

Throughout the entire course of this study, the ARFF Study Committee has provided input in the form of questions, answers, and recommendations to ADOT and the Contractor; reviewed and commented on the *First, Second* and *Third Draft Reports*; and participated in regularly scheduled committee meetings to help resolve issues in a timely, efficient, and objective manner.

On August 8 and October 11, 1995, the Committee held their final meetings and formalized their recommendations in connection with this study (see Appendix M for Meeting Notes). These recommendations are summarized as follows:

- **Build a regional ARFF training facility in Arizona** - Based on (1) the demonstrated existing and future training needs of both aviation and non-aviation fire fighters; (2) the potential benefits to the air traveling public; (3) and the limitations of obtaining similar training elsewhere, the Committee members enthusiastically make this recommendation.

- **Utilize conventional fuels for aircraft mock-up and pool fire training** - Because of the realism, (i.e., "Train like you fight" philosophy), experience (i.e., proven track record) and affordability, the Committee unanimously decided that conventional fuel training technology is the most desirable. Propane-fueled simulators for aircraft component mock-ups (i.e., engines, wheels/brakes, etc.) would be an acceptable alternative.

- **Design and build the aircraft simulator following the British concept** - In order to obtain the benefits of conventional fuel, "live fire", training while reducing smoke emissions, fuel consumption and construction/operation costs, this design concept should be adopted into the Arizona facility, according to the Committee. In this case, the British concept has been modified to include the capability to create large pool fires.

- **Facilitate the combined use of an ARFF training facility with other existing or planned facilities** - Because there are significant mutual training benefits to both ARFF personnel and other potential users (i.e., non-certificated and general aviation airports; federal, state, and local fire departments; the military; educational institutions, etc.) the opportunity to provide cross training should be maximized. Other benefits include an expanded revenue base to help support the facility and potentially significant cost savings in infrastructure.

- **Locate the ARFF training facility at the highest ranked site** - Based on the results of the site evaluation process, the Committee has ranked the sites as follows:

    1. Tucson Public Safety Academy
    2. Williams Gateway Airport
    3. City of Phoenix Emergency Services Institute
    4. Yuma U.S. Marine Corps Air Station
    5. Evergreen Air Center
    6. City of Holbrook
    7. Kingman Airport
    8. Prescott Airport

  The highest ranked host site (Tucson Public Safety Academy) will have six months to prepare and submit an application to FAA for funding. Failure to meet this condition will result in the loss of ADOT's and the committee's support, and the next highest ranking site will become the preferred site, with the same condition.

- **Identify and obtain commitments from the sources of funding for the design and construction of the ARFF training facility** - In light of declining "discretionary" funds on federal, state and local levels, cost sharing and other financial commitments for this project need to be secured as soon as possible.

Although the Committee has completed its assigned task of overseeing and providing input to this study, their continued involvement is available on an "as needed" basis. The Committee Chairman, Mr. Larry Larkin, should be contacted regarding any future consultation, questions, or clarifications in this regard.

10.10.2 Consultant's Recommendations

Throughout the course of this study, the Consultant, Greiner, Inc., has also received valuable input from FAA and ADOT staff, various regulatory agencies, the aviation and fire fighting communities, and the owners/operators of other ARFF training facilities across the country and around the world. Prior to this assignment, Greiner's personnel have been similarly involved in the planning, design, and construction of numerous other ARFF training facilities.

From these experiences, the Consultant's recommendations in connection with this particular project are respectfully given below.

- **Implement the ARFF Study Committee Recommendations** - The outcome of this study resulted in several specific recommendations that pertain to (1) the project's feasibility, (2) the optimal locations, and (3) the preferred technology (see Section 10.10.1). The affirmative resolution of these plans will help ensure a successful project.

- **Provide post-feasibility study coordination with project participants to ensure continuity and follow through** - FAA, ADOT, the Committee and the preferred host site share responsibility for turning the ARFF training facility concept into a reality. This will likely begin by (1) formalizing agreements with the host site; (2) identifying sources of federal, state, and local funding; and (3) initiating the necessary application process with FAA. A motivated and experienced coordination will ensure these essential tasks are completed in a timely fashion.

- **Involve the host and the facility users in the final planning and design stages of the project** - This study developed some preliminary ARFF training facility concepts and layouts that need to be finalized with input from those that will use and maintain it.

- **Continue coordination with ADEQ and any appropriate local agencies in connection with potential air quality issues** - Regulatory acceptance for the operation of an ARFF training facility is normally issued with an Open Burn Permit. However, because of the significant commitments and benefits associated with this project, acceptance should be obtained at the highest levels of these regulatory agencies.